THE

ELECTRICAL REVIEW.

VOL. LXIV. FEBRUARY 12, 1909. No. 1,629.

ELECTRICAL REVIEW.

Vol. LXIV.] CONTENTS: February 12, 1909. [No. 1,629.

	Page
Private Interests and Public Information	241
The Workmen's Compensation Act	242
Acetylene Gas Lighting	243
The Improvement of Tramway Construction	243
Flats	243
The Need of Co-operation in the Electrical Industry... ...	244
Correspondence:—	
Home Office Regulations for the Supply of Electrical Energy	244
Fibre as an Insulator	245
Electrical Fatalities in Collieries	245
Working Destructor Plant	245
Common Courtesy	245
Tired Arc Lamps	245
Combined Track Circuit and Cab Signalling	246
Electric Light *v.* Gas	247
Legal	248
Business Notes	250
Notes	260
Electricity Supply in Bristol, 1909 (*illus.*)	261
The Effect of Foreign Competition upon British Designs ...	264
City Notes	268
Stocks and Shares	272
Electric Tramway and Railway Traffic Returns	272
Share List of Electrical Companies	273
Railway Electrification (*illus.*) (*concluded*)	275
The Routin Automatic Regulator (*illus.*)	277
Proceedings of Institutions:—	
The Public Supply of Electric Power	278
The Röntgen Society	279
Parallel Operation of Alternators (*illus.*)	280
Our Legal Query Column	281
New Electrical Devices, Fittings and Plant (*illus.*)	282
Foreign and Colonial Tariffs on Electrical Goods	283
New Patents Applied For, 1909	284
Published Specifications	284

THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

TO BE OBTAINED BY ORDER FROM ANY NEWSAGENT IN TOWN OR COUNTRY.

OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGNERAY, LONDON." Code, A B C.

Telephone Nos. Holborn 963 Central 4435 (Editorial only).

ALL Letters should be addressed to the Proprietors, H. Alabaster, Gatehouse & Co

ADVERTISEMENT RATES ON APPLICATION.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has

BY FAR THE LARGEST CIRCULATION

of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES.—Per annum, postage inclusive, in Great Britain, 19s. 6d., Canada, £1 1s. 6d. ($5.30). To all other countries, £1 10s.

BINDING.—Subscribers' numbers bound, including case, for 4s. each volume.

CASES.—Cloth Cases for Binding can be had, price 2s. 6d. each; post free 2s. 9d.

READING CASES, to hold from One to Twenty-six Numbers until the volume is complete for Binding, can be had from the Publishers, Price 6s., or Free by Post (in Great Britain), 6s. 6d.

FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London), to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

NOW READY.

THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

PRIVATE INTERESTS AND PUBLIC INFORMATION.

FROM time to time we come across instances of the way in which useful information, which would be of value to the community if published, is withheld from motives of private interest which, while they perhaps reflect credit on the discretion of the managers of engineering enterprises and the loyalty of contractors concerned in the matter, are yet unsatisfactory from the point of view of the larger public interests to be served. We would be among the last to force a confidence or to endeavour to persuade the publication of any information which would be of an injurious nature to the development of any business, and we realise that there are in certain parts of our industry trade secrets which are the private property of individual firms, and which it would be inadvisable, in the interests of fairness and of the stimulation of individual research, to publish to the world. There are, however, other cases where it is to the best interests of the community that information should be published, and where adequate reason does not exist for its being withheld; such cases are by no means so rare as would be considered likely in this age of somewhat strenuous self-advertisement. Some of the descriptive matter appearing in the technical journals would be of greater value if it contained more of the vital details

One recent case, which must only be considered as a type of many others, is the problem of the cost of the unwatering of mines by electricity. This is a subject the British practice in which has not been hitherto completely dealt with. In view of the rapid strides which electrical engineering is making in connection with mine equipment, it is a particularly interesting matter which requires technical treatment. In the interests of the engineering fraternity, therefore, published data would be of interest. But we believe that there is a difficulty in getting to know to any exhaustive extent the technical details of this work in Great Britain, not because any secret is, or can be, made of the use of electricity in this connection, but because mine pumping is looked upon as a necessary evil by owners of collieries. They do not wish to draw attention to the fact that there is in any particular case a great volume of water to be disposed of, inasmuch as it might be argued by some shareholders that a large proportion of the money invested in the mine was spent in overcoming a natural defect which was absent in other coal workings. Colliery managers will be found to be quite willing to give details of electric haulage, electric ventilating, and electric hoisting, inasmuch as any figures published under these heads serve to indicate the magnitude of the undertaking; but electric pumping, although technically interesting, is apparently kept under a cloud. It is an unwelcome subject. Descriptions of electric pumping have, of course, appeared; but our impression of this unwillingness was strengthened by the avowal of a manufacturing firm to whom an inquiry on the same point was addresed, that

although they had had a good deal of experience in this class of work, they did not think that colliery-owners would be particularly pleased to have even their names mentioned as having a large pumping plant.

Whether this be really so or not—and we only quote this as an illustration of a conceivable case where private interest may, in some form or other, be opposed to general technical information—we would put the following conundrum—to what point does it pay a specialist to suppress information? In raising such an issue we are aware that we are attacking the formidable barrier that divides British exclusiveness from the "open door" policy that is so characteristic of American enterprise. Anyone who has attempted to compile information on any special subject will know that it is often ten times easier to get a complete thesis on the matter from abroad than to obtain a few scanty lines from a British firm. Which pays the best? How long will the man who adopts the policy of the oyster be able to keep his knowledge to himself and at the same time make use of it? We have met such men in the shops; and on the whole, though they may have one or two carefully guarded wrinkles, their isolation has placed them in an inferior position to that of the man who barters one item of information for another. And the same holds good with regard to the publication of information in the technical Press. The rapid engineering progress of a nation is shared by every individual; that progress cannot be obtained without the dissemination of knowledge. We appeal for the more liberal spreading of technical information by persons interested in the latest developments. Private interest and public information may occasionally find themselves in direct antagonism, and in that case it is the duty of the technical journal to stand aside. There are cases, however, where the opposition is imaginary or far-fetched, and in such an event the educational value to the engineering public of the technical journals should be considered.

THE WORKMEN'S COMPENSATION ACT.

A PAPER of considerable interest to those who are concerned with the working of the Compensation Act, was recently read before the Medico-Legal Society, by a doctor who acts as Medical Referee to the Union Assurance Co. Although his treatment of the subject was primarily connected with the duties of doctors and lawyers, he made certain statements which concern those who have to pay the piper, namely, the employers and insurance companies. According to a report in the *Law Times*, he said that the Acts were framed with the intention of providing means for genuine workers who were disabled in the course of their employment, but unhappily in practice they had led to much hardship to employers, and had exposed them to the plots and plans which lazy or dishonest men were ever ready to form in order to extract money. Such men were aided and abetted by the least reputable members of the legal profession. He knew as a fact that it was the custom of some of the latter gentry to ascertain from the porters at the hospitals the names and addresses of casualties treated there, and to offer to take charge of the cases of the injured men. They then proceeded to place every difficulty in the way of an amicable settlement in order to increase costs, and, finally, when the case was settled, the unfortunate workmen found that only a proportion of the money awarded came into their own pockets, whilst, in the event of the claim not being sustainable, and of the employer gaining the case in the County Court, no costs were ever forthcoming from the unsuccessful side. For this reason employers, or, rather, insurance companies—for these risks were usually covered by insurance—were very loth to contest a case, and preferred to come to terms, even though the case was recognised to be untenable. Workmen and their advisers were quite aware of this, and they used the fact to extort money on every possible occasion. Workmen had now only to meet with some trivial injury to make up their minds not to return to work without making a good sound profit from the mishap. Most of them still belonged to friendly societies and clubs, and, so long as they could deceive the club doctor (who was usually too overworked to give their cases careful consideration) and could persuade him to go on signing their club papers, they were getting half-pay from their employers and a substantial allowance in sick pay from their clubs, and were often receiving more money than if they were at work. Dealing with malingering, Mr. Morley, the writer of the paper, said that injuries to hands and fingers were very often turned to profit. A man would pretend he could not get a proper grip because of a slight injury; his employers had no work of a lighter character to offer him, and he would not apply elsewhere for work of an easier sort. It was impossible for the examining surgeon to swear in Court that there was no disability; the man exhibited a slightly stiffened finger to the sympathetic Court, and was promptly awarded compensation. A method which might help to put a stop to these bogus claims would be to pass an Act rendering solicitors who undertook such cases on speculation personally liable for the employers' costs if the Court held that the case was brought on insufficient evidence. The writer of the paper was inevitably led to the conclusion that, beneficial as the Acts had proved from many points of view, they had numerous and great defects, and that further legislation was still required to protect employers from unfair and extortionate claims. Another point was that it was most unsafe for an employer to engage the services of any worker who was not thoroughly sound in every way, although at the same time the infirmity might not appear to render him in any way unfit. Sooner or later the conditions which existed would give rise to complications which might be made the basis of a claim for accident. Insurance companies were already finding out that workmen's compensation insurance did not pay them at the present rate of premium, and before long they would, he ventured to prophesy, either increase their rates or perhaps insist on careful medical examination of all employés prior to their engagement by the insured. One large railway company with which he was connected had all candidates for employment examined, and he had instructions to reject any men who had any condition which could conceivably bring about complications for which claims could arise, although their maladies were quite trivial and not incompatible with continued health and hard work for many years. If this stringent medical examination became general, and it was Mr. Morley's belief that the insurance companies would before long insist upon it, the Acts would have proved themselves anything but a blessing to genuine workers, and would bring many a man who had some trivial lesion or abnormality, to a condition of chronic unemployment. One possible way out of the difficulty would be to legalise the process of "contracting out" of the liability. Several men whom he had been obliged to reject had themselves suggested that they should sign a paper absolving the company from any liability should they break down at work as a result of their abnormalities, but, unfortunately, this would not be recognised by law. Another suggestion he would make was that the responsibility of the costs of an unsuccessful claimant should be thrown upon the union or the solicitor who had taken up the case, if the workman himself could not pay them. This would put an end to the present position of affairs, which, from the workmen's standpoint, was, "Head I win, tails you lose." Failing this, it might be practicable to insist upon the costs of both sides being secured before a case was allowed to be placed upon the lists of the Court.

Acetylene Gas Lighting.

It will interest a large number of electrical contractors, who spend a good part of their lives trying to keep the owners of country houses from making the fatal mistake of putting in acetylene instead of electricity, to hear that a case has been tried before the Recorder of Cork, in which acetylene is made to shine by its own light, and does it poorly. A good report of the case is to be found in the *Irish Ironmonger* for January. It was an action brought by a Cork firm of brassfounders and plumbers against the Cork Harbour Rowing Club to recover £50 for works, labour and services.

It appeared that the defendants determined to light the club-house with gas, and that the plaintiffs' estimate and specification for acetylene was accepted, and the plant duly installed. The plaintiffs guaranteed to supply 355 c.p. for five hours, but the Club complained that the quantity and duration of the light were defective, whereupon a larger plant was substituted, but the complaints continued as to leaks, the haze in the rooms, and shortage of supply. The makers of the plant stated in evidence that the shortage on test arose from the pressure being increased from the normal 2½ in. to 3 in., by weights being put on the gasholder, but the Club maintained that at 2½ in. the candle-power was insufficient for reading, so that the increased pressure was essential. It came out in evidence that with the first plant there were complaints from the start about the bad light, and afterwards about leaks, while nearly every Saturday night the light went out. When the larger plant was put in, the leakage was extensive, and became worse, and the smell was bad; the consumption of carbide was larger than the contractors represented, and whenever the weight was off the gasholder, the light was useless.

Finally, the club became so disgusted with the installation that they called upon the contractors to take it out. This the contractors refused to do, whereupon the club removed the fittings and plant themselves.

Judgment was given for the club, the Recorder saying that there was a substantial failure to carry out and comply with the terms of the contract.

How many times do electrical contractors have the cheapness of acetylene thrown in their faces when they approach country gentlemen and others? "Oh, I could not think" say they, "of putting down an expensive engine and dynamo and battery, when I can get an acetylene plant to give me double the light at half the capital expenditure, and for almost no running cost at all." So well taught are they!

But now we have one of those rare opportunities of seeing the inner truth. Usually such failures are screened so carefully that the world at large is no wiser, but sometimes stubbornness on both sides results in a flood of light being thrown in dark places, and we learn why acetylene is so cheap. No wonder that it can compete with an electric plant which will give a continuous supply for as long as may be required, not merely for some uncertain fraction of half-a-day; which will respond to a demand for anything up to 100 per cent. more than its rated output at any time, instead of refusing to give even a full load output, unless the period of lighting is decreased; which will not make a haze in the rooms, or create a highly unpleasant smell.

Unfortunately, the purchasers are the last people to read a technical journal, and it must rest entirely with the electrical contractors to disseminate the information which we are able to glean from time to time.

The Improvement of Tramway Construction.

Mr. Hooghwinkel, in the January number of the *Tramway and Railway World*, premising that British tramways on the whole do not pay, and that German tramways are constructed and worked much more cheaply, proposes to save the British situation by radical alterations in track, rolling stock, and overhead construction; and anyone who has read the author's previous contributions will be prepared to hear that a mixture of American and German practice is recommended.

We agree that a flexible sleeper-borne track would be a great advantage to the tramway owners, and possibly to the passengers, but we think that the general street user will not have any desire to see a departure made from the present solid concrete and sett-paved track. On the other hand, we hold the opinion very strongly that since the horse car became obsolete, it is unreasonable to make the tramway undertaking pave two-thirds of the street very much better than it was ever paved before; and if some part of that burden could be lifted from its bent shoulders, the "average tramway" would have a better chance of showing a net profit.

Mr. Hooghwinkel attacks an impregnable position when he throws himself against that national institution the double-decked car. At one time we, too, were very near an attack of single-deckitis, but we are confident now that the double-decker is the right thing in the right place. It is peculiar that the British should be almost singular in the use of this queerly disproportioned vehicle, but without doubt it has a firm hold upon our affections, and we can only think that this is because our menkind like fresh air, scenery and a pipe when travelling, while women prefer a closer atmosphere, and gossip uninterrupted by struggles to keep hats on and hair in place. So much do men detest any suggestion of being battened down, that they only tolerate top-deck covers because of the shelter afforded during wet or unusually boisterous weather.

Our habit in this matter being fixed, it is useless to waste time traversing Mr. Hooghwinkel's other reasons for desiring to supplant the present form of car. He harps once more on the sliding bow, wishing to see this form of collector oust the trolley; and we are very curious to learn whether it is pure conservatism only which keeps the trolley in fashion. The advantages claimed for the bow are weighty, and it is used with apparently successful results upon many thousands of cars in Europe, but its use in these islands is confined to one or two lines.

Mr. Hooghwinkel suggests the use of wall rosettes wherever possible, and everyone will agree that this is desirable. He suggests also the use of flexible trucks, and we believe that they would be wanted badly on the kind of tip-wagon track which he proposes to lay.

At present but little is known about the use of pay-as-you-enter cars in this country, so that it is rather early to be advising their general adoption, and it will take a good many Mr. Hooghwinkels to persuade the B. of T. out of their present objection to trailers, even if the use of such things were desired by the generality of tramway managers.

On the whole, therefore, we do not find ourselves in accord with Mr. Hooghwinkel's ideas.

Flats.

Prof. Hancock, of Purdue University, has shown lately the destructive effect produced by a flatted wheel, and it would be just as well for our tramway men to realise that they may be depreciating their rails and equipment pretty badly, besides maddening all the frontagers, whenever a "flatted car" is allowed to stay on the road.

The energy of impact varies directly as:—

1. The weight of the wheel and its load.
2. The square of the velocity.
3. The square of the length of the "flat"; and inversely as the square of the diameter of the wheel.

With a 33-in. wheel having a 2½-in. flat, and carrying a load of 6,000 lb., the kinetic energy of the blow delivered to the rail at a speed of 30 m.p.h. is greater than 1,000 ft. lb. A flat spot 2½ in. long can be produced by a wear of 0·05 in. depth of metal, and such spots are worn sometimes in making one stop on a bad rail.

Obviously, therefore, when such tremendous hammering is in question, the rails, setts, and joints of the track must suffer; and, equally, those parts of the car, such as motors, wheels, and axles which are below the truck springs.

The speed assumed above is much above the usual speed of cars within city limits, but it is approximated on open services, and is, at all events, useful as an example.

Our attention was drawn to the matter by a leaderette in a recent number of the *Electric Railway Journal*.

THE NEED OF CO-OPERATION IN THE ELECTRICAL INDUSTRY.

[FURTHER COMMENTS AND CRITICISMS.]

Mr. W. R. Rawlings, A.M.I.E.E. (of Messrs. Rawlings Bros., Ltd., and past-president of the Electrical Contractors' Association) writes :—

"I have read with interest the pamphlet (which is a fine specimen of the printers' art) on the 'Need of Co-operation in the Electrical Industry,' and I should like to make the following observations :—

"The tendency of to-day is towards 'co-operation.' It is found a necessity in many trades, and professional men and others find that they can no longer afford to oppose one another's views and interests. True co-operation in any industry must in the end result in mutual benefit to all those engaged in that industry.

"Broad views are desirable, but, in my opinion, the 'Electrical League' is attempting to spread its net a little too wide. What interest does the ordinary shareholder take in the business in which he is a shareholder? My experience has been (and I am interested in several Limited Companies) that it is the exception and not the rule for any recommendations as to the conduct of the business to be received from a shareholder, and in view of this, what assistance will a large body of shareholders be to the 'Electrical League' even if they could be induced to join?

"I have had some experience with Association work and know how difficult it is to get those interested to become members, even when their bread and butter is at stake. Moreover, any scheme of co-operation requires a good deal of money spent by way of advertising and the distribution of literature, and is, therefore, a costly operation. On this point alone, I fear the 'Electrical League' is doomed to failure, seeing that its subscription is only 2s. 6d. per annum. That would be little more than enough to cover postage and printing for the usual notices and reports to members and others, unless, of course, the provisional committee propose to carry out this part of the work free of charge. Then, again, clerks and offices will be found necessary, and after these expenses have been met, there will be little left to carry into effect the objects suggested in the pamphlet before referred to, even if 10,000 members could be enrolled during the next two or three years.

"While I agree with co-operation in principle, I have yet to learn that the industry would benefit through the 'Electrical League,' or that any advantage would be gained by becoming a member of it."

Mr. J. Swinburne writes as follows :—

"In answer to your inquiry, I consider there is a great need of organisation among the various divisions of the electrical industry. It is especially important that the industry should be able to influence Parliament to prevent any sort of repressing legislation by ordinary Act of Parliament, and to give powers to undertakers without hedging them round with all sorts of restrictions which are supposed to benefit sometimes the general public, but much more frequently the working class alone. At present it seems to be assumed that to give any undertaker Parliamentary powers to enable them to carry on a business for the benefit of the public, is giving them such an enormous privilege that all sorts of concessions must be exacted in return, as a price for the privilege of being allowed to serve the public. Undertakers ought to be encouraged to meet the wants of the public wherever such wants exist. If meeting such a want is a very good paying thing for the undertaker, it only shows that the public is suffering severely from the want of it.

"Whether it is possible to organise a league with enough influence to be of service is the question. One of the many necessary conditions is that such a league should not be political, and should keep clear of all such questions as Socialism, and checking imports and exports. Of course, the Fiscal Question ought really to be discussed on economical lines; but it is now political, and therefore there is little but nonsense and mendacity to be read on either side."

Mr. Justus Eck, M.A., M.I.E.E., writes as follows :—

"I have to thank you for forwarding me a copy of the pamphlet issued by the pioneers of this movement. I have only now had the opportunity of looking at all carefully into the propositions laid down in the same.

"It is to be regretted that such a lengthy production did not more accurately deal with the views of the gentlemen issuing it, for undoubtedly there is scope for the establishment of a league carrying on work generally on the lines indicated, but whether with such vagueness this is likely to lead in the directions desired for the general benefit, not only of the industry but of the country at large, I am unable to say.

"It is quite true that the electrical industry has suffered from want of a proper organisation to represent its conjoint interests in Parliament and elsewhere, but it is equally true that the Institution of Electrical Engineers, so long as its qualifications for membership are those of a technical nature, cannot be qualified to represent the various interests of the industry.

"It is only during the last few years that the various sections of the commercial side of the industry have organised themselves, and with undoubted advantage, although it is not easy to get a consensus of opinion sufficient to establish a joint effort from any body of Englishmen. There, however, always remains the advantage of utilising the energy and impetus of the promoters of the League, and this should not be neglected, even though there may be many difficulties and failures before the proper objects are achieved.

"I therefore welcome the Electrical League as one of the necessary preliminary steps to a permanent organisation of the industry for the benefit not only of itself, but also of the public at large."

"**Tramway**" contributes the following :—

"I was shown the other day a circular from one of the British Electric Traction Companies—the Metropolitan Electric Tramways, Ltd.—and signed by Mr. James Devonshire, I believe as managing director, covering a pamphlet upon the Electrical League. Apparently the B.E.T. companies are distributing the pamphlet in question.

"The Industrial Freedom League having disappeared, the B.E.T. is apparently launching the crusade. After reading the pamphlet, and your well-considered leading article on the subject, I feel that although a new organisation may be desirable, yet the Electrical League on the basis described savours too much of the political hue. In any case, I should imagine that we do not require an Electrical League for the purpose of increasing the powers of a Tramway and Electric Lighting and Power Trust."

Mr. James Taylor expresses the view that there is a great deal that could be done by co-operation.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Home Office Regulations for the Supply of Electrical Energy.

In perusing the extract of Mr. Jas. Swinburne's report *re* above, contained in your issue of the 22nd ult., it appears to me that the full meaning of Regulation 13 is somewhat obscure, where it states that all metallic portable apparatus or pendant lamps for alternating current or pressures above 150 volts direct current are to be efficiently earthed.

This, taken literally, would mean that practically *all* portable table standards and hanging lamps fitted with switches attached would have to be rewired with three wires instead of two, the third wire being connected direct to earth, as there are very few installations now in existence under 150 volts direct, and there is no limit given in the clause for alternating current.

If this interpretation is correct, the expense of making these alterations will be greater than many consumers will be willing to incur.

But why should the definition of "low pressure" in Regulation 13 be limited to 150 volts, when in all the rest it is 250?

Again, why should alternating currents of any voltage be considered more dangerous than continuous? My own personal experience (extending over the whole period during which electric lighting has been in vogue) is that 500 volts alternating, when earthed through the body, does not produce as painful, or I should imagine as dangerous, a shock as 300 volts continuous under similar conditions.

In any case, unless the meaning of the words "low pressure" were properly defined, it would be better to delete them altogether, and specify the actual voltage in figures both for alternating and direct current.

F. W. Cooke, M.I.E.E.

G.N. Ry., Retford, *February 4th*, 1909.

[This matter was fully dealt with on pp. 162-3 of our issue of January 29th. It will be observed that private houses, shops, &c., which do not come within the scope of the Factory Act, are not affected at all; in other cases, it is only where a conducting floor or other medium renders users liable to shock that the clause applies.—Eds. E.R.]

Fibre as an Insulator.

Your correspondent, "Puzzled," describes in the February 5th issue a short circuit between + and − conductors in a fusebox, these conductors being separated with U-shaped pieces of $\frac{1}{8}$ in. vulcanised fibre.

More particulars might prove interesting—the location of the fusebox in question, with special reference to climatic influences; the possibility of dust settlings getting at the live parts, and whether on an A.C. or D.C. circuit.

As a rule all fibrous materials should be vacuum-dried and impregnated with a good moisture-resisting insulating fluid while in a hot state, to prevent moisture re-entering the materials, especially in this damp climate and weather such as we have been experiencing of late.

If the above fusebox was on an intermittent or A.C. circuit, then the very best insulator—unless it filled the whole space—would tend to lower the insulation value between conductors.

For a full explanation of this paradox, see the *Proceedings* of the Institution of Electrical Engineers, Vol. XXX, 1901, page 621.

T. W. H.

Manchester, *February 5th*, 1909.

Electrical Fatalities in Collieries.

Referring to Mr. Sydney F. Walker's letter in your current issue of the Review, I think that the moral to be drawn from it is the competency of the electrician in charge, as I presume Mr. Walker is thoroughly acquainted with Rule 11, Sec. 1, of the Coal Mines Regulations Acts relating to Electricity in Mines, which states that a competent person shall be in charge of the electrical plant whilst in use.

There have been several letters in your paper from various readers, suggesting that the charge electricians of collieries shall form a society amongst themselves with a view to assisting the managers of collieries to have thoroughly competent men to take charge of this responsible and dangerous work. It would certainly be as well if the Board of Trade issued certificates as they do to marine engineers, and in the meantime it would, no doubt, help matters considerably if a society was formed of competent men, framing the rules so as to ensure that they shall be thoroughly experienced and hold a certificate as a guarantee of competency.

I do not wish to take up your valuable space by relating what I have met with during my colliery experience as to men who have had the sublime cheek to take charge of a colliery plant, also as to the work done, but would suggest a few rules for the new society, if it is formed, as follows:—

1. That each member must have been in charge of a colliery electrical plant for at least 12 months, or have worked as assistant for at least two years previous to joining.
2. That each member shall be prepared to give a satisfactory reference or testimonial from present or past managers.
3. That each member shall be thoroughly acquainted with the Rules and Regulations of the Coal Mines Acts relating to Electricity in Mines.
4. That each member must be prepared to pass a practical examination in order to obtain a certificate of competency, and after the society has been fairly established, that no new members shall be admitted without having gained this certificate.

Should any of your readers be of the same opinion as myself, I shall be pleased to hear from them with a view to carrying out the formation of a society of colliery electricians, and so minimising as far as ever possible the subject of this letter.

J. Williams.

Whitehaven, *January 31st*, 1909.

Working Destructor Plant.

Those engineers who have destructor plants in connection with their electricity works know their drawbacks. One of the worst is the incessant cleaning-out. I mean more especially the cleaning-out of the combustion chamber. When very high temperatures are reached the deposit settles in practically a solid state in this chamber. This necessitates a lot of time being wasted in cleaning out every three or four weeks as the case may be. This acts at the same time against the men working in the destructor trying for big heats, as they know what to look forward to in cleaning out, when they have to use sledge hammers and picks; and at the same time it is a bad thing for the brickwork, as it seems impossible to keep all the scale from coming away from the walls, leaving the brickwork bare. If any of your readers could give me any information as to how to keep the deposit in its fine state without solidifying into a solid mass, and at the same time to be able to keep a high temperature in the combustion chamber, I should be very thankful.

W. A. Walker.

Electricity Works, Kettering,
February 2nd, 1909.

Common Courtesy.

As a chief engineer of a good many years' standing, the writer cannot refrain any longer from addressing an open letter to some of his colleagues, on a question which must affect them in a similar manner to himself. Scarcely a week passes now without his receiving a long list or two of queries from some borough electrical engineer requesting information, sometimes of a most extraordinary nature. The writer has on all occasions given, as far as possible, the information required, but the time seems to have arrived when some sort of a stand should be taken against a system which is most certainly being abused. What is meant by its being abused is this: It very often happens that several of the questions asked require no small amount of work to answer; usually an intimation is given that all replies received will be tabulated and copies sent round to those who have been good enough to supply the information, and the writer enters his strong protest against the extreme lack of courtesy that has been meted out by some inquiring engineers, who have not only neglected to acknowledge the receipt of the replies, but also failed to send on a copy of the tabulated lists as promised.

Disgusted.

Tired Arc Lamps.

I have been surprised to read the answers to "E.W.B.'s" inquiry, and thought the reason for the gradual decrease in light from enclosed arc lamps was apparent to everyone.

In my mind there is no doubt that the falling-off in light is due to the reduction of current, caused by the

increase of ohmic resistance in the steadying resistance, which, in turn, is due to oxidisation and crystallisation.

The remedy is, of course, to readjust the steadying resistance.

Percy Watson.

Grimsby, *February 5th*, 1909.

I had exactly the same trouble as "E. W. B." with a number of enclosed lamps. I think the only cause of a reduction of light can be a shortening of the arc, and if the pressure across the lamp is correct, the trouble must be due to wear.

The series coil of most enclosed lamps draws the core right home to get the correct length of arc, and the core is usually connected to the rocker by means of a spring. This spring I found to be slightly "set," and when in tension it was slightly open, thus failing to draw the correct length of arc. As the spring is compressed by the weight of the core when the lamp is switched off, it is difficult to discover the fault.

I think "E. W. B." will find the cause of his trouble is some simple thing, which is very easy to overlook. I shall, however, be extremely interested to hear if he gets over the trouble, and what he found to be the cause.

The lamps I have charge of have not again become "tired," although the new springs were fitted before the winter.

D. E. McDonnell.

Bray, *February 8th*, 1909.

COMBINED TRACK CIRCUIT AND CAB SIGNALLING.

A Reply by Capt. A. GARDINER, R.E.

With reference to the letter by "The Writer of the Article" on the above subject in your issue of December 11th, I fear that my reply of December 8th raises little beyond that already dealt with in Col. Gardiner's letter published in your issue of January 4th.

The article that gave rise to this correspondence condemned my proposals unconditionally as "impracticable"; this sweeping verdict being (I think I am justified in saying) admittedly based, not upon technical defects, but upon an alleged intention on my part of dispensing indiscriminately with the human element upon the track. Such intention was not expressed in the paper, its existence was controverted by the model that illustrated the paper, and could only be inferred upon the supposition that I was unaware that railway working involved other duties besides signalling; duties, moreover, which an installation of automatic *signalling* would be incompetent to perform.

Col. Gardiner held that this inference was hardly a generous one. As it happens, we are both of us professional railway men; and while railway working is so vast a science that one may spend a lifetime in its practical study and then know but a little of one of its branches—still, even I have probably passed the stage thus attributed to me. "The Writer of the Article," however, considers that the claim that credit might have been given to the author of a paper on automatic apparatus for knowing that that apparatus "can only perform such functions as its design permits, opens the very wide question of how far a critic is justified in straying from the path marked out by that author." Without any desire to restrict this latitude, I would, however, submit that there are limits to the length of a paper intended for reading at an Institution meeting. The subject of the paper now under discussion was, after all, the defects of the present system of signalling by semaphore; and while there may be defects in other directions than those considered, the special respect in which this defectiveness becomes apparent, which was treated in my paper, was the inefficiency of the present link between "the signal" and "the signalled to." And in this respect manual and track circuit installations are equally lacking.

After considering this aspect of my subject, I ran briefly through some of the attempts that are now being made on various railways—both manually and automatically signalled—to remedy these defects, and pointed out the respects in which it seemed to me that they failed to promise general satisfactory results; and then finally made my own suggestions for drawing a closer bond between the engine and the track.

Although my proposals involved the aid of the track circuit, I assumed that its capabilities were common knowledge. I did not consider that a detailed investigation of the actual methods of track-circuiting junctions and yards came within the scope of the existing paper, and I do not think that I was to blame that it never entered my head that "the track circuit as illustrated" therein would be taken as any criterion of what is ultimately possible with this combination of an electric current and the track. I would, however, now hasten to say that there is no difficulty whatever in arranging for the track circuit to signal ahead if desired; as it has, I believe, often been made to do for the purpose of warning level crossings of the approach of trains, and in America in single line signalling.

It may, perhaps, help to clear up the differences between my critic and myself, which I believe to be largely due to misunderstandings, if I explain that the "control" over automatic signalling that I had in my mind when expressing the opinion that it was "undesirable," was control either of the nature of, or admitting of, interference.

I refer now to contrivances for enabling signalmen to "supersede" the automatic working of the signal when out of order, and had, as I say, in my mind the accidents that have occurred (one I believe even in India, where automatic working is as yet rare) owing to signalmen, supposing the signals to be out of order, having cancelled danger indications that were really being correctly given. An automatic signal should be proved to be capable of working unattended with a degree of accuracy that will reduce risks and delays to traffic below that possible with manual working, and it should then be left to itself; being passed, if necessary when out of order, at "danger," with the engine crews alert, as is at present the custom on track-circuited sections. The expression as to manual control, which has attracted so much attention from my critic as to be quoted three or four times over in his letter of December 11th, occurs in the midst of a special consideration of certain proposals that had recently been made to irrevocably ensure obedience to signals; and I was pointing out that in the case of automatic signalling (which if indeed "no more infallible than man," who at least can be taken to task for his mistakes, would assuredly not be allowed to control traffic by the English Board of Trade) this would involve the presence of man with power to overrule its indications if an absolute *impasse* was not to be reached in the event of any breakdown of the signalling system. Inasmuch as such overruling may fail to be correctly interpreted by the driver, in addition to being possibly an error on the part of the pointsman (as I prefer to call him), I do not consider its possibility desirable; and I consequently prefer to make the control of my signal over the movement of the engine ultimately subject to human will, as explained in the paper, in preference to making the apparatus on the track so subject.

Having made this explanation, however, as to the so-called "dictum," I would state my belief that it is possible, and even desirable, to get a far greater degree of direct representation of the state of the track by that track itself than my critic has, perhaps, quite realised, and I have endeavoured to make this clear in the diagram which follows. But in attempting to show one scheme for equipping the tracks shown in the plan on page 1000 of your issue of the 11th ult. for the purposes of my signal, I trust your readers will realise that the track circuit has many far more able and experienced exponents than I, and that, if there be (as there probably are) flaws in the track circuiting as shown, these arise, at least probably, from my inexperience in tackling such problems, and not from any inherent incompatibility of the track circuit itself.

(*To be continued.*)

ELECTRIC LIGHT v. GAS.

The City Lighting.

At a time when there is much controversy as to the lighting of the public streets, and as to whether they should be lit by high-pressure gas, either of the inverted or ordinary type, or by electricity, actual curves taken of the different methods of lighting thereof, as shown by the experiments being carried out at the present time in different parts of the City of London, may be of interest.

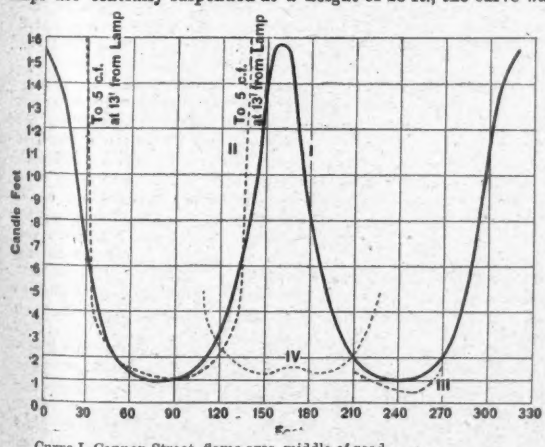
We do not propose to enter into a discussion as to whether the horizontal or the direct method of photometry is the more suitable for street work, but will simply state that all the figures given in this article are horizontal; it is generally admitted that these convey more information than direct readings, especially as regards minimum illumination. We accept the figure given by the electrical engineer of the Corporation of London in his recent report for the minimum illumination, viz., one-tenth of a candle-foot in the main thoroughfares, as the criterion of a well-lighted street.

First, then, let us take Curve I, fig. 1, which shows the horizontal illumination along the centre of the road in Cannon Street, which is lit by electric flame arc lamps suspended over the centre of the road. It will be seen that the maximum illumination is 1·55 candle-feet, while the minimum is ·1 candle-foot.

Now let us take a street of practically the same width, shown in Curve II, *i.e.*, Fleet Street, near No. 29, where inverted gas lamps of the latest type are fixed up on brackets to the houses. It will be seen that they also at this spot give a minimum of ·1 candle-foot, but although their minimum is the same, owing to these lamps being suspended only 15 ft. from the ground, the maximum rises to 14 candle-feet. This figure is calculated, as the highest value which the instrument in use at the time would measure was only 5 candle-feet, and this was obtained at a distance of 13 ft. from the lamp. Lower down Fleet Street, by No. 150, further tests were taken, the lamps here being fixed on brackets to the houses at a height of 17 ft. 6 in. The result is shown in Curve III, where for a space of nearly 40 ft. along the kerb the lighting was below ·1, and therefore can be written down as insufficient illumination for a main street. Curve IV was taken along the kerb line on the north side of Fleet Street, by No. 19, where the lights are low, and shows, so far as the minimum illumination is concerned, good results, but, of course, has the same very high maxima near the inverted burners.

The figures taken on the same test show the candle-power of the lamps outside the area of the reflectors to be on the average 1,200 c.p.

All the curves above mentioned were taken in line with the lamps; that is to say, in the case of Cannon Street, where the lamps are centrally suspended at a height of 28 ft., the curve was taken along the centre of the road, and in Fleet Street, where the lamps are suspended on brackets fixed to the houses, nearly over the kerb, the line is taken along the kerb. As is well known, however, in many cases this is not the absolute minimum, as in kerb lighting very often the minimum illumination is found to occur in the centre of the road on a diagonal between two staggered lamps; therefore, the illumination curve was also taken along the centre of the road in Fleet Street and along the kerb in Cannon Street, and these curves, for the purposes stated above, are comparative. The result is shown in Curve V, fig. 2, for the high-pressure inverted gas, and in Curve VI for the suspended flame lamps in Cannon Street; in these cases the curves speak for themselves, because we find a point in the centre of Fleet Street, where the illumination drops below ·1 candle-foot, while nowhere on the kerb in Cannon Street can we find a lower illumination than ·18.



Curve I, Cannon Street, flame arcs, middle of road.
Curves II, III, IV, Fleet Street, high-pressure inverted gas, along kerb.

Fig. 1.—Illumination in Line with Lamps.

Let us now consider these curves on their merits. The only case where gas does compete as regards the minimum illumination with the electric light is in the instance where the lamps are erected on brackets 15 ft. from the ground, in which case, for all intents and purposes, the minimum is the same, but, comparing the maxima, we find 14 candle-feet with the gas, against 1·6 with the electric light; it may be said that this is a minor point—but is it? The ideal system of lighting is daylight, where the maximum is equal to the minimum, and although this cannot be obtained in practice, the nearer one gets to it the better must be the effect. Where the gas lamps are fixed at 15 ft. from the ground, drivers of vehicular traffic, such as 'bus-drivers, and people on the top of 'buses, are on a level with the light, that is to say, they are placed with 1,200 c.p. within about 6 ft. of their eyes; comment is needless. If any of our readers wish to know what it is like, they can do so by taking a ride on the top of a 'bus down Fleet Street at night.

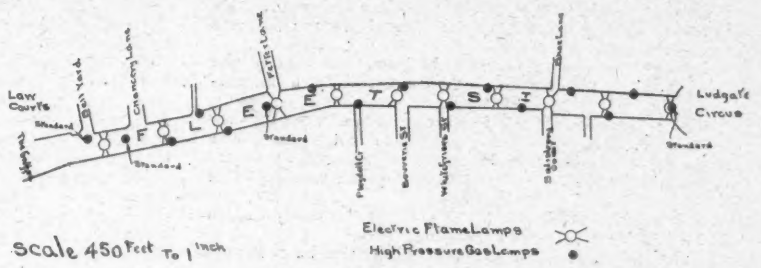
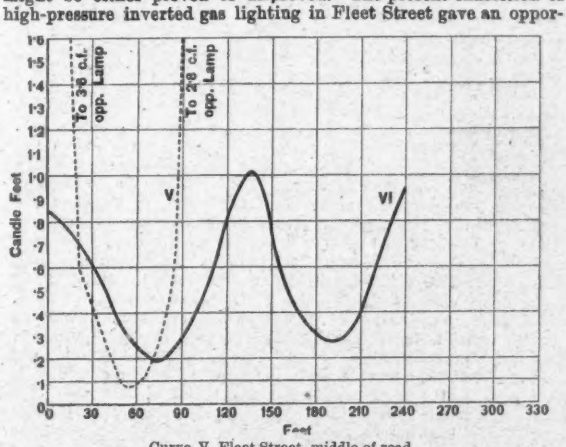


Fig. 3.—Plan of Fleet Street, showing Positions of Lamps.

Next, let us turn to the question of price. The electric supply companies concerned have quoted a price of £17 10s. per lamp, while the gas company has quoted £16 each for the lamps in Fleet Street, per annum. In fig. 3 we give a sketch of Fleet Street, showing the positions of the gas lamps already fixed on brackets to the houses, and also the positions in which electric flame lamps would be suspended centrally at a height of 28 ft., the same distance apart as in Cannon Street; the curve of lighting, therefore, would be exactly the same as the curve at present in Cannon Street. It will be noticed that there are 16 gas lamps against 11 electric lamps; the cost works out at £256 per annum for gas as against £192 10s. for electric light, showing a saving in this street alone of £63 10s. per annum, together with, as we have seen, a much better and more even illumination. But this is not all; a centrally suspended lamp fixed at the junction with a side street saves, in many instances, another lamp in the side street itself. It will be seen by the plan given above that lamps would thus be saved in Fetter Lane, Bouverie Street, Whitefriars Street, Shoe Lane, and in Salisbury Court; again, therefore, comment is needless.

These curves and costs were got out in order that the statements one hears that "Gas is better and cheaper than electric light" might be either proved or disproved. The present exhibition of high-pressure inverted gas lighting in Fleet Street gave an opportunity which was thought especially suitable for comparing the two systems. It appears that, taking these figures as correct (and they can be proved by anyone who will take the trouble to stay out of bed late at night for the purpose of testing the lighting of these streets when they are clear of traffic), the claim that high-pressure gas, whether with inverted or ordinary mantles, is in any way cheaper or better than the electric flame arc lamp for the lighting of public streets, is fallacious; in fact, the real state of the case is very much the reverse. The city electrical engineer was perfectly correct when he stated that, light for light, high-pressure gas cost four times as much as the electrical flame lamp; this figure is now reduced, as undoubtedly the tests show that the inverted burner is a great advance upon the old type, but still, as regards both cost and effective illumination, there is much in favour of the electric flame arc as compared with the inverted high-pressure gas mantle.



Curve V, Fleet Street, middle of road.
Curve VI, Cannon Street, along kerb.

Fig. 2.—Illumination Remote from Lamps.

Street Lighting in the City.

LEGAL.

Re The Improved Electric Supplies, Ltd.

(*Concluded from page* 224.)

The hearing of the counterclaim in the action of Muff *v.* Cunnington, which had been referred for trial to an Official Referee, again occupied Mr. Verey during the whole of last week.

Mr. Thompson, cross-examined, said that for the purpose of their own business the value of the stock as a going concern was £4,467. Witness had no documents to show when the stock was written down. The company, which was known as the Improved Glow Lamp Co., of which witness was manager, was taken over by the Improved Electric Supplies, Ltd. He admitted that after 18 months' trading the Supplies Co. showed a deficiency of £5,000.

Mr. Colam: And do you think that a company having creditors to the amount of £5,000 after 18 months' trading was a very valuable connection?—Witness thought it was, when there were customers on the books who had been there for ten years. He denied that a company which had made such a loss in 18 months had a name not worth trading with.

If this was such a very valuable business, how was it you succeeded in failing after 18 months?—Unfortunately the requirements of capital were under-estimated.

Continuing, Witness said that in arriving at the price of £7,500 for the business, he added together the whole of the assets and obtained a figure of £10,700. He then allowed one-third for depreciation, and added to it the estimated profits on orders still in hand, which worked out at £7,500.

And that was the figure which was given as "severely written down"?—I don't think I need say any more.

Re-examined, Witness declared emphatically that he would not have sold the business for a copper less than £7,500.

Mr. Cleveland, one of the directors of the Improved Electric Supplies Co., stated that he interviewed the defendants on the question of the purchase. Every facility was given them to examine the stock-books and the assets of the company. He denied that during the negotiations anything was ever said to the effect that should the stock not turn out as represented in the stock-book an allowance would be made. He agreed that the failure of the Electric Supplies, Ltd, was due to want of capital.

Mr. Snowden said that on March 6th, 1907, he was appointed voluntary liquidator of the Improved Electric Supplies, Ltd.; before that he had acted as auditor to the company. He had never given Mr. Thompson instructions as to the basis on which the stock-book was to be kept. The first he heard of defendants was by a telephone message from them after it had been decided to sell the company. They made inquiries as to the assets, but witness said he could not give them definite figures. An interview followed, but witness never made any representations as to the value of the stock because he did not know it. No statement was ever made to his knowledge that if the stock was not all there an allowance would be made. When the contract was being discussed by the parties at witness's office, he and his partner objected to the words contained in it, viz., "Stock a fair representation."

Mr. A. Habe, solicitor, of Cheapside, E.C., said he had acted for the Improved Electric Supplies Co. since the company was formed, and was acting for the debenture-holders in connection with the present case. When it was decided to sell the company, there were several offers of purchase. The debenture-holders, for whom witness was primarily interested, were only concerned to the amount of £6,500, and anything over that went to the creditors. As the assets were over the value of the debentures, the Official Receiver had to be consulted, and when that was done he refused to consent to a sale until a meeting of the creditors had been held. On May 7th, 1907, the meeting was held, and by that time the offers for the business were two, each standing at £7,500, one of which was the defendants', the other being from the Consolidated Electric Supply Co. The latter firm increased their offer to £8,000 at the meeting of the creditors, with the result that the meeting was adjourned in order that Messrs. Alison & Cunnington, who were not present, might consider the position. They also increased their offer to £8,000, and eventually, during the adjourned meeting of creditors on May 15th, they still further increased it to £8,250, and a resolution was passed accepting the purchase. It was the intention to sell the business as from the date of the liquidation, viz., March 6th. This having been settled, it was then pointed out that there had been trading since the date of the liquidation, and, as a matter of convenience, it would be better to note what were book debts and what was stock. Witness pointed out that it would be a lengthy business to make out a list, and suggested that the list should be taken from the existing list, assuming that that would be the Official Receiver's list of March 6th. In making this suggestion, witness did not intend it as in any way a warranty, and that it should be a warranty was not asked for or insinuated in any shape or form. The stock sheets were suggested simply as a list of stock on March 6th in order to have an easy method of adjustment when matters arrived at final completion. When witness made this suggestion his assumption, unfortunately, was wrong with regard to the stock sheets. Instead of being a list of March 6th, the date of the winding up of the company, it was a list of the stock on the previous December 31st. On May 17th the contract was engrossed for signature, and the defendants were allowed to enter into possession of the premises. Before signing the contract, defendants had said that they wished to take possession of the business at once as the orders in hand were wasting, and they wished to prevent a greater wastage than was necessary. They were, therefore, pending the consent of the Court, put in as managers. When witness showed the contract to the Official Receiver he objected very much to the fact that the book debts were up to March 6th. He said that the statement he had made to the creditors was that the business had been sold for £8,250 at the time he had made the statement, and that therefore the creditors would have the advantage of about £1,300 worth of book debts, which were in the schedule of Mr. Snowden. Witness had told him that that was perfectly ridiculous, but none the less when witness went before the Court for the approval of the contract, the Official Receiver opposed the sanction, with the result that Mr. Registrar Hood gave the order conditionally, saying that he would only approve of the order subject to the date of taking over being altered. When we had found that he could not get unqualified consent to the order, he informed the defendants' solicitors and tried to effect some compromise. His idea was to get a sale, lock, stock and barrel, on May 17th, which meant a certain re-adjustment of the purchase price, but then the mistake with regard to the stock schedule became apparent. The position was an awkward one, and another meeting was held to discuss the matter. It was then arranged that Mr. Alison should make out a statement of what allowance he claimed. Another meeting was held on May 31st when Mr. Alison produced his statement, but witness at once objected to it because it contained references to depreciation. He contended that it should be simply an allowance with regard to stock. However, he showed the statement to the Official Receiver who declared that another meeting of creditors must be called. The earliest date at which the meeting could be called was June 18th, and Mr. Cunnington and his solicitor were present. Witness explained how the muddle had arisen, and the Official Receiver blamed him, whilst he, on the other hand, rather thought it was the Official Receiver's fault. It was not a pleasant meeting, no resolution was passed, and the thing "fizzled" out. It was obvious from the attitude taken up by Mr. Cunnington, who, with his partner, were in possession, that they would do nothing to help a solution of the difficulty, which was not lessened by the fact that the lease of the business premises would shortly expire. After a conference with Mr. Snowden, witness came to the conclusion that defendants were not acting *bonâ fide* as the company's managers, and he advised Mr. Snowden that it would be justifiable to turn them out. Witness accordingly arranged that certain men should take possession of the stock, and not leave it day or night. Defendants, of course, were very indignant at first, but witness explained matters to them, and, finally, after a great deal of talk, they "calmed down." Eventually, after very onerous terms, namely, that certain sums should be paid out of the purchase money in preference to the second debenture-holders, witness got the Court's approval to the purchase, and he communicated this result to the defendants who retook possession of the business. Later witness instructed valuers to go to the premises, and make a list of the stock there. This was done. They simply made a list, not a valuation. No valuation was ever made by them of the stock.

Mr. Snowden was then re-called for cross-examination. In answer to Mr. Cecil Dwyer, who appeared with Mr. Colam for defendants, Witness admitted that the only proper way if depreciation had taken place in the stock, was to write down the value in the stock-book.

Counsel: Assuming that this stock was defective, damaged and in the condition it has been alleged, do you, as a chartered accountant, say it is a proper thing to put them down in the stock-book at cost price?—Assuming they were depreciated articles they ought to have been written down.

Mr. A. Keith Baylor, electrical engineer of 20 years' experience, and formerly of the British Thomson-Houston Co., &c., stated that he inspected the business of the Improved Electric Supplies, Ltd., as a representative of the Consolidated Electric Supply Co., Ltd. Afterwards he sent his auditors to inspect the books, and an engineer and store-keeper to examine the stock. Having got reports from these persons, he made three offers for the purchase of the business. The first £7,000, second £7,600, and the last £8,000. Witness saw all the stock, and by checking it off with the record book estimated what the stock was. Anyone who went through the stock rooms and counted the articles, &c., could easily arrive at a fair estimate of what the stock was worth. Witness was given every opportunity to do this, and Mr. Thompson placed no difficulties in his way at all. The result of all his investigations was an offer of £8,000.

Cross-examined, Witness stated that he certainly would not have made an offer for the business on the strength of his own casual examination.

Counsel: In other words, you would not have trusted the stock-book?—Witness replied that he would not make an offer until he had made a thorough examination. One did not generally buy things without looking at them.

In a properly prepared stock-book, if you had stock on hand which had suffered depreciation, you would expect to see that depreciation written off?—If the firm is conservative I should, but some firms don't.

Re-examined, Witness said the amount of depreciation in the stock in question was entirely a matter of opinion. He desired to purchase the Improved Electric Supplies, Ltd., not for the sake of the stock, but because he wanted the goodwill of the business.

Mr. H. Harrison, electrical engineer, with 10 years' experience of street lighting, stated that the I.E.S. was a keen competitor of his, and he could testify to the goodwill of that company.

Mr. Acland, K.C., at the conclusion of the evidence, then addressed the learned Official Referee on behalf of the plaintiffs. He said that it was important that the learned Official Referee should see what it was the defendants had bought, because it had a very material bearing on the question of damages. The plaintiffs' case throughout had been that what was sold was the business and undertaking of the company and what belonged to it. That had a material bearing on the question of damages, because if there had been an untrue representation or a breach of warranty,

it had been laid down that the measure of damages was the difference between the thing as warranted and the value of the thing as it was, and one was not entitled to take any particular part of the thing which was sold, and say, "On my valuation of this part of the business I have been done, although the value of the business as a whole is the same." If the defendants had got the business at a price which showed they had had their money's worth, then they had suffered no damage at all. If, on the other hand, defendants had got a business of less value than it was alleged to be, the measure of damages was not the difference the defendants put on one part of it, but the true difference between the value of the whole of it. The learned counsel then contended that the defendants had no reason to complain of the bargain they had made, and that there was no evidence of misrepresentation.

Mr. Colam replied, and the Official Referee reserved judgment.

Colliery Employe Prosecuted.

At Consett (Durham) Petty Sessions on the 8th inst., Ernest Dodds, motorman, employed at the Hamsterley Colliery, near Ebchester, was charged with having infringed the special rules at the colliery.

Mr. J. M. Aynsley, who prosecuted, said the defendant was a motorman employed on a coal-cutting machine, and it was a part of his duty to see that the electric cable, which worked on a drum, was kept clear of the machine. On January 16th, defendant allowed the cable to get under the machine, the result being that the insulation round the cable was stripped off. Defendant, who had hold of the handle at the time, received a shock, and was thrown upon the machine. He was rescued by his assistant, and had since been unable to follow his employment.

Mr. Cummings, the manager of the colliery, explained how the accident had occurred, and said he thought the Act had been infringed through carelessness, and not wilful disobedience.

After hearing other evidence, the Chairman of the Bench said as the defendant had already suffered severely, and the case was not pressed, he would be let off on payment of 9s. costs.

The King *v.* Mr. Garrett, Metropolitan Police Magistrate and the Hammersmith Borough Council (*ex parte* London United Tramways).

[Tramways and Road Repairs.—An Important Appeal.]

In the Divisional Court on Monday the Lord Chief Justice and Justices Walton and Jelf heard this case.

Mr. Bodkin, for the Hammersmith Borough Council, said he appeared to show cause against a rule for prohibition which was obtained at the instance of the London United Tramways, Ltd., and directed to Mr. Garrett, the magistrate at the West London Police Court, prohibiting him from further considering certain informations charging the tramways company with some offences against the Acts of Parliament which applied to their undertaking. They were private Acts, but they incorporated the Tramways Acts, and imposed penalties for breach of certain sections of the Tramways Act. The nature of the complaint was that the roadways on which the tramways were laid in the borough of Hammersmith were out of repair so far as such parts of the roadways were concerned which were specified in Sec. 22 of the Tramways Act, 1870. That section imposed a liability on the promoters of tramways to repair the roadway between the rails, and if there were a double line of rails the roadway between both set of rails, and the roadway for a certain distance outside each set of outside rails. There were also informations charging the company with having omitted to repair the lines of the tramway and the tramways themselves. There were nine informations in all—three in respect of the Uxbridge Road, three in respect of Goldhawk Road, and three in respect of King's Street, Hammersmith.

The Lord Chief Justice: What is the ground of the rule?

Mr. Bodkin: The short point is this. The defendants submitted to the magistrate that, there having been no arbitration before an arbitrator appointed by the Board of Trade, there could be no prosecution for those offences before the learned magistrate. The case having been partly opened before the magistrate, counsel on the other side took the point I have named, and the magistrate considered he had jurisdiction; but, in order to enable the company to have the question considered, he adjourned the summons *sine die*. The question turns upon the Tramways Act, 1870, and several provisional orders which are rather confusing, because they apply to different sections of what is now the whole system. Counsel afterwards referred the Court to various sections in the provisional orders which were incorporated in the ordinary Acts of Parliament. Proceeding, he said that what the Tramway Co. had done was to repair the roadway in patches, leaving holes here and there. The Tramway Co. said that they put the surface in a proper state of repair, and the Borough Council said they had not done so.

The Lord Chief Justice: Ought not the Tramway Co. to reasonably satisfy you? It is not a question of the Tramway Co. saying, "We admit that the road was out of repair, but we have done the work and you ought to be satisfied with it."

Mr. Bodkin: Sec. 28 says: "To the satisfaction of the local authority." Here we are the responsible road authority, and I submit it is one of the cases in which there are numerous instances where the local authority is given an absolute discretion as to the propriety of certain work affecting the public.

Mr. Justice Walton said that as advised the question seemed to be whether the road was out of repair, and not whether the work was satisfactory.

Mr. Bodkin: Yes, and if it is out of repair in the opinion of the local authority, then it is their duty to see that the road is put in repair.

The Lord Chief Justice thought that if the Tramway Co. had admitted that the road was out of repair, the magistrate had jurisdiction to order the company to pay a penalty of £5 a day; but if the Tramway Co. said that the roadway was in repair, then the only question was whether what they had done was sufficient to satisfy the local authority, in which case he thought the case ought to go to arbitration first. He thought that the Council's informations clearly left in doubt what they were summoning the company for.

Mr. Justice Walton: The section is that they shall keep the road in repair according to your direction, and the offence charged is that they have not obeyed your directions. Is not that a question which, in cases of difference, should go to arbitration? Unless you can make out that you have an absolute right to judge in the matter, I see a difficulty in your way.

Mr. Bodkin: That is what I contend. You have an exact parallel to it in the Public Health (London) Act of 1891, where, for instance, drainage work or sanitary work, has to be done to the satisfaction of, and as directed by, the local authorities.

Mr. Justice Jelf: Is there any arbitration clause there?

Mr. Bodkin: No.

The Lord Chief Justice: What was the rail summons?

Mr. Bodkin: The words are "contrary to the Act of 1886, in that you did not maintain and keep in good condition and repair, so as not to be a danger or annoyance to the ordinary traffic, rails or tramways laid by you in the Uxbridge Road."

The Lord Chief Justice: That is more difficult, because that is simply in Sec. 8 of the Act of 1870 It seems to me to be a broad question of fact whether the rails are out of repair.

Mr. Bodkin submitted that under Sec. 28 there was a clear and specific duty on the Tramway Co. to repair the road surface, and that the local authority were entrusted with the duty of seeing that it was properly repaired. The remedy for the non-performance of the duty was a remedy which left no room for arbitration whatever, because it gave a right of re-entry to do the work.

The Lord Chief Justice intimated that the Court was against Mr. Bodkin on the road and the tramway summonses, and he asked if counsel wished to proceed with the rail summonses alone.

Mr. Bodkin said he claimed to go on with the summonses for not keeping the tramway rails in proper repair. That was a very important matter.

Mr. Macassey, in support of the rule, dealt only with the summonses relating to the rails not being kept in proper order. The local authority, he said, had directed the London United Tramways to do certain things to the rails.

The Lord Chief Justice: What do you say was the direction given you about the rails?

Mr. Bodkin: No directions were given as to the rails, but directions were given as to the repair of the road surface.

Mr. Macassey said the local authority called upon his clients to maintain and keep in repair the rails. The tramway authorities said the rails were in good condition and repair, but the local authority said they were not, and promptly summoned the tramway authorities, who now said that that came within the arbitration section. The intention of the legislature was to submit all those matters which were technical matters to the decision of an expert tribunal, such as the Board of Trade. It was said that the joints of the rails were not being properly maintained.

The Lord Chief Justice: I have a very strong suspicion that those three informations as to rails were only put in as a gangway to try and get over the other difficulties; but it may be that that is not so. Mr. Bodkin says it was put in because there was a serious question about the rails themselves.

Mr. Bodkin: There were no difficulties anticipated at that time.

The Lord Chief Justice, in giving judgment, said the Court was of opinion that they could not decide on those summonses as to rails without having more facts before them. The rule raised questions of difficulty, but after the very clear argument they had had the only difficulty he had was as to one of the sets of summonses, as to which they were not now in a position to finally decide the matter. For some reason or other, in regard to each of the tramways, three sets of summonses were taken out. The first summons was for an offence under the Tramway Act, 1870, "in that you did not keep in good condition and repair with such materials and in such manner as the road authority did direct, so much of Goldhawk Road as lies between the rails and near the outer rails of the tramway respectively." He presumed that the other two summonses in regard to the roads were in the same terms. There was also a set of three summonses, one of which was that, contrary to the Tramways Act, they unlawfully failed to maintain and keep the tramways in Goldhawk Road in a good condition and repair and to the satisfaction of the Borough Council. The third set of summonses set out that they did not maintain and keep in good condition and repair, so as not to be a danger or annoyance to the ordinary traffic, the rails of the tramways laid down in Goldhawk Road. Different considerations arose with regard to the third group of summonses. The Tramways Act of 1870 was intended to be applied to a number of undertakings when they were sanctioned by Parliament, and it contained a group of sections. With regard to a number of matters in those sections, it undoubtedly was intended that the arbitration clause should be the means of ascertaining the rights and obligations of the tramway company. Sec. 28 provided, "The promoters shall at their own expense at all times maintain and keep in good condition and repair with such materials and in such manner as the road authority shall direct and to their satisfaction so much of any road." That was the section which created

the obligation under which those summonses with regard to the road were taken out. The Act contained a proviso that if the promoters failed to comply, the road authority might do the work necessary and recover the amount. He would express no opinion as to whether or not, if the road authority exercised that power, the expense could be recovered. It might be there was room for arbitration after the power had been exercised. Mr. Bodkin's main argument was that the arbitration clause did not apply to Sec. 28 at all, and that the work must be done as the road authority should direct and to their satisfaction. He said, therefore, they were the absolute judges, and there was no room for arbitration at all. Sec. 33 provided that if any difference arose between the promoters and any road authority in relation to any tramway with respect to the mode of executing the work, or whether the work was such as ought reasonably to satisfy the local authority it should be settled by an engineer. His Lordship could not see any possible reason why Sec. 28 should not come within the arbitration clause. The main argument advanced was that because there was a remedy given to the road authority to do the work there was, therefore, no room for arbitration. He would have come to the conclusion that that view was wrong quite apart from any legal authority, and that it was contrary to the judgment in the Croydon case. The judgment of the Court of Appeal certainly recognised that there might be a difference between the local authority and the tramway company in a matter connected with repairs which would have to be dealt with by arbitration. Therefore, in his opinion, both the reasonable construction of the Act and the authority of that decision, was against the contention put forward by Mr. Bodkin. Mr. Bodkin went on to say that his position was strengthened by later Acts and provisional orders as to those sections which gave a penalty in respect of the company not keeping the things in repair. When they had a direction given by the local authority which the tramway company said they ought not to be called upon to obey, or they had obeyed by carrying out certain works, then a direct issue arose as to whether the tramway company had reasonably done their duty. Therefore it seemed to him that with regard to the summons which had raised a question of whether what the tramway company had done ought to be regarded as a reasonable fulfilment of their duties, and ought to reasonably satisfy the authority, there was the necessity of having their dispute arbitrated upon before the issue of the summons. With regard to the rail summonses, they were not in the position to say that the magistrate had no jurisdiction. It seemed to him that what would be a danger or annoyance to the ordinary traffic might well be a question of fact which the magistrate could deal with. He did not intend to decide that if a real question arose before the magistrates, such as the road authority requiring some particular work to be done to the rails, and the tramway company saying they had done that work, or they had done the work which ought to be reasonably accepted in satisfaction, there would not be a dispute which ought to go to arbitration. But it seemed to him, upon the simple question of the rails being out of repair so as to be a danger to ordinary traffic, the Legislature might well have thought that that was a matter which did not require any question as to the satisfaction of the road authority. It was an ordinary question of fact which the magistrate could well decide. He was unable to say that the summonses for not maintaining the rails in proper condition so as not to be a danger or annoyance to ordinary traffic, could not be upheld. He was inclined to think that the last three summonses were only issued for the purpose of trying to get jurisdiction, but he was told by Mr. Bodkin that he was quite wrong, and, therefore, he desired to withdraw the observation. His Lordship thought they could not stay the three summonses as to the rails, but they made the rule absolute with regard to the other six summonses.

MR. JUSTICE WALTON agreed. He said that under Sec. 28 of the Act of 1870, the obligation upon the promoters was not to repair the rails of the road to the satisfaction of the road authority absolutely, but the obligation was to repair those parts of the road to the reasonable satisfaction of the road authority, and the same had to be said of the obligation to repair the tramways to the satisfaction of the local authority, which was imposed by the Act of 1882. He thought, therefore, that whether a question arose under this section as to whether the road authority had reasonably to be satisfied or not, that question, whether it arose on a summons for penalties or in any other proceeding between the road authority and tram company, must go to arbitration under Sec. 33.

MR. JUSTICE JELF concurred, and an order was made accordingly, no costs being allowed.

Two Motors v. Four Motors for Bogie Cars.—In order to show how diametrically conflicting opinions co-exist, yet appear to give satisfaction to their respective holders, it is sufficient to refer to pages 1331 and 1503 of the *Electric Railway Journal* (U.S.A.). On the first it is reported that the Chicago Railway Co. has equipped its new cars with four 40-50-H.P. interpole motors, while on page 1503 of the next issue we find that the Metropolitan Street Railway Co., of New York, after a thorough consideration of the subject, determined to use two-motor equipments with maximum traction trucks, this decision being based principally upon the higher cost of the four-motor car, and because the height of the step for the maximum traction car is 15 in., as compared with 18½ in. for the equal-wheeled car. So many men, so many minds!

BUSINESS NOTES.

Bankruptcy Proceedings.—S. V. BOJESEN.—On Wednesday, February 3rd, at the London Bankruptcy Court, a sitting was held before Mr. Registrar Giffard, for the public examination of Sigurd Svern Bojesen. (See ELEC. REV. January 8th, p. 56.) The statement of affairs showed total liabilities £7,388 (unsecured £4,912) and assets valued at £1,585. Replying to Mr. W. P. Bowyer, assistant receiver, the debtor stated that he was a Danish subject, but at intervals, since 1888, he had been resident in England. In July, 1905, he promoted a company styled "The de Forest Wireless Telegraph Syndicate, Ltd," with a nominal capital of £120,000, to which he sold certain patent rights of the de Forest system of wireless telegraphy, which he had purchased for £40,000 in cash and shares. The sale price to the company was £105,000, paid as to £5,000 in cash, and the balance in shares, one-third of which were used directly or indirectly for the purpose of enabling him to complete his purchase. Witness attributed his insolvency chiefly to the liquidation of the Amalgamated Radio-Telegraph Co., Ltd.—The examination was concluded.

GEORGE SUTCLIFFE (trading as George Sutcliffe & Co.), electrical engineer, 22, Church Street, Abertillery, Mon.—This debtor attended the Town Hall, Tredegar, last week, for his public examination before Mr. Registrar Davies. The liabilities were put at £542, and the assets were estimated at £228. In answer to the Official Receiver, debtor stated that he commenced business in January, 1904, at Abertillery. The electrical business did not pay, and he took up the business of cycle dealing, but this also did not pay. He had borrowed money from his parents, and had also received £50 as a premium in respect of a friend's son. The case was eventually adjourned for cash accounts to be filed.

W. T. GARNETT, electric cable and wire manufacturer, Bradford.—February 25th is the last day for receipt of proofs for intended dividend, by Mr. E. Musgrave, 1, Bank Street, Bradford.

ROBERT RUSSELL, electrical engineer, trading as R. Russell & Co., The Garage, Dryad Street, Felsham Road, Putney, and 51, Bangalore Street, Putney.—The statutory first meeting of the creditors was held on the 10th inst., at 132, York Road, Westminster Bridge, S.E., the Official Receiver (Mr. Ll. Howell) presiding. The debtor had filed a statement of affairs showing gross liabilities £835, of which £748 was expected to rank. The claims of fully secured creditors amounted to £67. The assets were estimated to realise £617, the estate thus showing a deficiency of £150. The Official Receiver remarked that the assets consisted entirely of book debts, and said that if they realised the amount at which they were set down there would be a very good dividend for the creditors. His experience was, however, that debtors were a little too optimistic in estimating their book debts. Debtor commenced trading for himself about eleven years ago as an electrical engineer, he having previously been a department manager in the employ of a London firm. In 1900 he took premises at Lower Richmond Road, Putney, where he traded under the style of Russell & Co., electrical contractors, up to February, 1905. He then removed to Putney. He had also been in partnership with a Mr. Black as motor engineers, his partner introducing no capital. In August, 1907, the partnership was dissolved, the debtor taking over the whole of the liabilities and assets. He attributed his present position to "loss of an action defended by him on the ground of misrepresentation, and bad debts." No resolutions were passed, and the matter was left in the hands of the Official Receiver.

Underfeed Stokers.—The following is a list of some of the stoker orders recently received by the UNDERFEED STOKER CO.:—

Yorkshire Electric Power Co., near Dewsbury	Two "E"
Rhondda Tramways, Porth, Glam.	Eight B.3
Leyton Urban District Council	One "E"
Folkestone Electricity Supply Co.	One "E"
Bahia Blanca power station	Eight "E"
Belliss & Morcom, Ltd., Birmingham	One "D"
Vickers, Sons & Maxim, Barrow-in-Furness	One "E"
Borough of Hampstead	Sixteen B.5

Contributions Invited.—The Editor of "Glover's Almanac" is again inviting original contributions of interest to electrical men for inclusion in its 1909/1910 issue to appear in June next. They are to be "preferably humorous or instructive." An announcement will be found in our advertisement pages to-day.

New Arc Lamp.—MR. G. BRAULIK, of 8, Lambeth Hill, E.C., informs us that he is about to put on the market a new long-burning flame arc lamp, which is of the same type as his "Eclipse" flame arc lamp, but is supplied with two separate sets of carbons and burns with one trimming for 35 hours. We understand that the lamp is arranged in such a manner that after one pair of carbons has been exhausted, the second pair is automatically switched in, in connection with a clockwork mechanism, and the arc is only broken momentarily, and the break is practically unnoticeable. The lamp is also fitted with an arrangement whereby after the second pair of carbons has burned out, the mechanism is adjusted automatically to the normal position, in order that the lamps may be retrimmed without trouble. The lamp is of the same size as the ordinary 16-hour type. A price list of the lamp will shortly be issued.

Osram Lamps in Germany.—In the issue of the *E.T.Z.* of the 4th inst., the Deutsche Gasglühlicht-Aktiengesellschaft (Auergesellschaft) announces the reduction of the price of 40 and 50-H.C.P. Osram lamps for 200-250 volts, from M. 5 to M. 3.50 (= 3s. 6d.). Osram lamps of 100 H.C.P. are reduced to 4s. 6d. each. Although the sales exceed 250,000 per week, the company is prepared to supply any quantity desired from stock immediately.

Isolated Plants.—Some years ago Bentley Priory, Stanmore, Middlesex, was partly wired and supplied with plant of approximately 12-H.P., but recently on the change of occupiers, it was decided to light electrically the whole of the building, and the contract was placed with MESSRS. STEGMANN & Co., of Clapham Junction, who have now just completed the work. The present supply is from a 20-KW. dynamo, belt-coupled to a 28-B.H.P. gas engine with town gas supply, with a storage battery of 880 ampere-hours capacity as stand-by, and the usual complement of switch-gear, &c. The lamps installed number over 600, and are all of Osram type. The building is of great historical interest, having been from time to time the residence of various notabilities, especially during the reign of William IV. Messrs. Stegmann also have in hand, besides a number of country and town residences, large contracts for electrically lighting the premises of Messrs. Illford's, Ltd., and Messrs. Garton Hill & Co.

American Westinghouse.—The *Liverpool Daily Post* says that a telegram from Pittsburg reports that, in consequence of the return of commercial prosperity, the WESTINGHOUSE ELECTRIC MANUFACTURING Co. has restored the old rate of wages to its 3,000 employés. This means that each employé will receive an average increase of about $15 a month.

Norway.—A new company, the NORWEGIAN ELECTRICAL AND BROWN-BOVERI, has recently been registered at the borough of Aker, at Christiania. The new firm is the result of a consolidation of the Norwegian Electrical Co. and the Norwegian Electrical Co., Brown-Boveri. The share capital is £77,777, distributed between 1,320 preference and 1,480 ordinary shares, fully paid.

Catalogues and Lists.—MESSRS. BRITISH INSULATED AND HELSBY CABLES, LTD, Prescot, Lancs.—New catalogue (56 pages) finely illustrating on art paper a large variety of their manufactures for telegraph and telephone line construction, particularly the Helsby insulators and bolts. Straight-line insulators, top-groove straight-line insulators, leading-in insulators, terminal and leading-in, iron-hooded, shackle, reel and miscellaneous insulators, also galvanised steel bolts, line wire, Sinclair solder and jointing and binding material are all included, sizes, reference numbers, dimensions, weights and prices being clearly arranged, in most cases, in tabular form.

THE ELECTRICAL Co., LTD., 121, Charing Cross Road, W.C.—Leaflets relating to the "Express" electric water heater, and "Aegma" metal lamps.

GENERAL ELECTRIC Co., LTD., 71, Queen Victoria Street, London, E.C.—Two new catalogues have just been issued. One is the second edition of their "Osram" list which has been increased to 18 pages, and now contains some new shapes and new voltages, including a 50-volt lamp, and a 25-volt round-bulb lamp, as well as higher voltages and candle-powers up to 400. Latest prices are indicated. The other ("W" section) is the thirteenth edition of the firm's illustrated catalogue of wires and cables. This has been brought up to date. In addition to clearly showing tabulated sizes and prices, particulars are also given of porcelain insulators, leading-in tubes, insulating material, wiremen's tools and various accessories. The list should be of service to all engaged in wiring and contracting work.

MESSRS. MUSGRAVE & Co., LTD., 97, New Bond Street, W.—Postal card illustrating one of their dust removal installations in a flax-carding room.

MESSRS. A. REYROLLE & Co., LTD., Hebburn-on-Tyne.—Two new lists, one (No. 6) giving details of sizes, prices, and dimensions of their dividing boxes and sealing bells for all types of cables; the other (No. 33) describing and pricing their drum-type D.C. motor starters to withstand heavy service.

THE CROSTHWAITE FIRE-BAR SYNDICATE, LTD., York Street, Leeds.—Four-page pamphlet relating to their "Crosthwaite" patent water-cooling plants. The firm manufacture coolers of the open or self-ventilating type, fan-draught coolers and natural-draught chimney coolers, also condensing plants, refuse destructors, gas producers, &c.

THE J.L. MANUFACTURING Co., LTD., Johnson-Lundell Works, Southall.—Illustrated list of D.C. laminated type machines, also price-list tabulating sizes, speeds, weights and prices of the J.L. standard protected motors of 230, 440 and 500 volts continuous current. These lists are issued pending the completion of the firm's illustrated catalogue, in which they will be embodied, together with the dynamo lists.

THE SUN ELECTRICAL Co., LTD., 118-120, Charing Cross Road, W.C.—Leaflet describing their "Bell" intercommunication telephone, and giving diagram of connections.

MESSRS. RANDALL BROS., of Palmerston Buildings, London, have sent us a perpetual calendar, with cards for daily changes. It will keep Berrite insulators continually before the user's mind.

MESSRS. MARPLES, LEACH & Co., LTD., Adnil Building, Artillery Lane, E.C.—Sixteen-page pamphlet, giving particulars of various motors and dynamos that are held in stock by them.

MESSRS. LUDW. LOEWE & Co., LTD, 30-32, Farringdon Road, E.C.—Twelve-page illustrated pamphlet relating to the De Fries patent automatic keyway cutting machines, for which they are sole agents. The machines themselves are shown, also some examples of work actually done by them.

MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., 6, Bath Street, City Road.—New price list (16 pages) giving illustrations of tantalum lamps with various shapes of bulb, and giving prices of same. In addition to a table giving a comparison of carbon and tantalum lamps, there is a table of voltages, candle-powers and dimensions of standard type tantalums.

We understand that the "Satisfied Consumer" poster of tantalum lamps has been displayed on hoardings in the large provincial towns, while similar show-cards have been exhibited in a number of trade establishments. The demand for them, we are informed, has been extraordinary, and MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., have now another supply to hand, which they will have pleasure in sending to those who require them.

THE ELECTRICAL Co., LTD., 121-125, Charing Cross Road, W.C.—New list, No. 294, containing illustrations and description of their "Ironclad" switches and fuses. Prices and reference numbers are given in tabular form.

THE ELECTRICAL REGULATORS AND ECONOMISERS, LTD., 16B, Cumberland Street, Liverpool.—Leaflet relating to Martin's patent electric regulator for dimming single lamps, slowing down small fans, &c., D.C. or A.C.

MESSRS. ELLIOTT BROS., Century Works, Lewisham, S.E.—Section P (16 pages) of their catalogue describing and illustrating various engineering instruments made by them, including Young's speed indicator, electrically-operated speed indicators and recorders, revolution counters, steam engine indicators, &c.

MR. H. K. LEWIS, 136, Gower Street, W.C.—Catalogue of new books and new editions added to Lewis's medical and scientific circulating library, October to December, 1908.

BRAKE BLOCKS & Co., 49, Spring Gardens, Manchester.—Booklet relating to Emmott's patent renewable brake blocks, which are made in two parts, of which one is permanent and the other is a wearing piece, which can be worn down to about 2 lb. weight, as compared with 10 or 12 lb. scrap in the case of the solid type of block. The changing of the shoes is also very much simplified.

MESSRS. PURCELL & NOBBS, 87-89, Cleveland Street, Fitzroy Square, W.—Price list of "Electroyl" radiators, in which the resistance wires traversed by the current are immersed in oil, contained in a sealed casing exposing a large surface to the air. The intention is to heat the air by direct contact, avoiding the radiation of heat to walls, &c. (see ELECTRICAL REVIEW, January 1st, 1909, page 12).

Book Notices.—*Le Frodi nei misuratori ellectrici.* By Ing. Macio Lanfranco.—The author exposes and analyses in the first part of this volume the principal kinds of mechanical and electrical frauds, both of an absolute and a relative character, going on to show the impossibility of absolutely preventing such frauds, although it is possible to adopt systems of control which may be used to repress some of the methods adopted. The third part of the work deals with the installation of meters, both from the point of view of the Italian financial administration and from the point of view of commercial electricity supply. Numerous tables are given, and diagrams of schemes of connections for facilitating the control of the measuring instruments. The chapter is clearly written, and will be of much assistance to the electrical profession, and particularly to those engaged in the testing of meters.

"Heavy Electrical Engineering." By H. M. Hobart. London: A. Constable & Co., Ltd. 1908. Price 16s. net.

"Science Abstracts," January 30th, Vol. XII. Part 133. Sections A and B. London: E. & F. N. Spon, Ltd. 1909. Price 1s. 6d. per section.

"Science Abstracts." Index to Vol. XI. Sections A and B. London: E. & F. N. Spon, Ltd. 1909. Price 1s. 6d. per section.

"Journal of the Western Society of Engineers." December, 1908. Chicago: The Society. Price 50c.

"Bulletin of Armour Institute of Technology." May, 1908. Chicago: The Institute.

"Science Examinations, 1908. Reports, &c." London: Wyman and Sons, Ltd. Price 6d.

"Corrugation; a theory and a suggested remedy.' By J. H. Briggs. Leeds: The Author, "Strathlea," Headingley. Gratis to applicants.

In view of the fact that the publication of the research work done at the Institute is now amply provided for in other ways, the *Technology Quarterly* will be discontinued after the December issue. The *Proceedings* of the Society of Arts and the *Bulletins* of the Institute will be published separately.

OUR esteemed German contemporary, the *Elektrotechnische Zeitschrift*—the principal electrical journal published on the Continent—recently announced that in accordance with many requests, the contents of the paper would in future be enlarged, particularly in the direction of economics. For this purpose Dr. F. Meissner had joined the editorial staff. We congratulate our friends on their prosperity, and have no doubt that the step they are taking will be fully justified by the results.

Anchor Cable Co. Annual Dinner.—The fifth annual staff dinner of the Anchor Cable Co., Ltd., was held at Leigh on the 29th ult., Mr. J. Bowyer, works manager, presiding. The Chairman, in proposing the toast, "The Anchor Cable Co., Ltd." said that although trade had not been very good throughout the country, the company could look back upon a very successful year. The Company was going ahead and going strong, thanks to the powerful backing of the parent company (Callender's Cable Co.) who in Mr. Tom Callender, Mr. Jas. Callender, and Mr. Peterson had some of the best men in the cable trade. Mr. James Callender, replying on behalf of the company, his brother, Mr. Peterson, and himself, said that when Messrs. Callender acquired an interest in the company things were not all that they might be, and they found that they had bought a heap of trouble. They had had some very hard, worrying years in Leigh, organising the affairs of the company and endeavouring to bring it into line with most of the other industries in Leigh in being a prosperous and dividend-paying concern. He believed that at one time the reproach was held out against the Anchor Co. that it was the only non-dividend paying company in Leigh. They hoped to remove that reproach in the near future. At first it was particularly difficult, because the business had been built up largely in heavy cables, and a small

and comparatively insignificant business was done in other kinds. The parent company took away all this big business and left the Anchor Co. with the small business in rubber cables. To-day, however, they had developed until the business of the Anchor Cable Co. was twice as much as it ever was in the past, even when they had the large cable business as well. Not only that, but the business was growing steadily and largely. The years of anxiety and worry for them had gone; they knew they were making money, and were in a fair way for becoming a prosperous and dividend-paying concern. He looked to the time when the Anchor Cable Co. would not always be the small brother of the Callender Co., but when it would grow up to be quite as big. The business was there to be done in the country, and they meant to get it. The name of the company stood well, and the repute of the Anchor cables was good. He hoped that they would eventually attain a position as good as, or better than, that of any other firm in the trade. The Chairman thanked the whole of the staff for the splendid way in which they had worked during the past year. Mr. M. Richardson replied on behalf of the works staff, and Mr. A. Cooke for the office staff.

Dissolutions and Liquidations.—Accumulator and Motor Construction Co., Ltd.—Creditors must send particulars of their debts, &c., to Mr. Jesse Smith, 79, Queen Street, E.C, the liquidator, by March 20th.

Empire Electric Light and Power Co, Ltd.—February 20th is the last day for receipt of proofs for intended dividend, by the liquidator, Mr. W. Allnutt, 5, Lime Street, E.C.

Graham, Morton, Ltd.—A meeting is to be held at the East Parade, Leeds, on March 11th, to hear an account of the winding up from the liquidator, Mr. R. Hilditch.

Graham, Morton & Co., Ltd.—At the same address on the same day, Messrs. Maurice Graham & Joseph Morton will give an account of the winding up of this company.

Scholes & Co, electrical and mechanical engineers and stores contractors, 4, Corporation Street, Manchester.—Messrs. A. Bowker and W. Scholes have dissolved partnership. Mr. Bowker attends to debts, &c.

Engineering Instruments, Ltd.—The petition for winding up this company, referred to in our last issue, came before Mr. Justice Swinfen Eady in the Chancery Court on Tuesday, and was by consent dismissed without costs. We understand that a scheme is being proceeded with for the reorganisation of the company, which has been approved by the shareholders, debenture-holders, and creditors.

Trade Announcements.—Messrs. E. E. Coy, 77, St. John's Road, Bootle, inform us that they have been appointed sole district agents for the sale of Messrs. Purcell & Nobbs's new patent Electroyl radiators.

Mr. Oswald Haes has taken into partnership Mr. H. F. C. Eggers, A.M.I.Mech.E., late of the Clyde Engineering Co., Ltd., and the New South Wales Railways, and the firm will continue its old agencies under the style of Haes & Eggers, at United Chambers, 2, Hunter Street, Sydney, N.S.W. Special attention will be devoted to electric power installation work.

Mr. Alfred Bowker has taken over the business of Messrs. Scholes & Co., electrical engineers, 4, Corporation Street, Manchester.

LIGHTING and POWER NOTES.

Aberdare.—A L.G.B. inquiry was held on February 2nd into the application of the U.D.C. for a loan of £17,000 for electric light purposes. There was opposition on behalf of local colliery companies and the gas company, and the inquiry was adjourned *sine die*.

Ballinamore (Ireland).—A scheme is on foot for the electric lighting of this town in lieu of the antiquated oil lamps, and shares representing £400 have been subscribed locally.

Birkenhead.—The T.C. has decided to supply electricity to the suburbs of Bidston, Noctorum, Upton, and Prenton, at 6d. per unit, a reduction of 1d.

Brierley Hill.—The B. of T. in deferring for a year the question of revoking the E.L. Order, 1900, has informed the U.D.C. that it will not be prepared to allow the order to remain in force at the end of that period, unless a definite scheme is in hand. The U.D.C. hopes to "farm" the order.

Caerphilly.—Mr. A. H. Preece has advised the U.D.C. that the demand for electricity in the Aber Valley is not sufficient to justify the Council incurring the liabilities and responsibilities which are obligatory, if the prov. order is made use of. Mr. Preece has been asked to discuss the matter with the Council.

Canada.—After considerable discussion with the directors of the Winnipeg Electric Railway, *re* buying up their plant, including their railway system and power plant, the Winnipeg Corporation has decided to go on with the municipal power plant at Point du Bois, and has signed the contracts for the work which were awarded recently. This means that the city will go into competition with the Winnipeg Electric Railway for supplying power, &c., in Winnipeg.

A severe storm of sleet played havoc with electric lighting, telegraph and telephone wires during last month. Not only did Ottawa suffer, but Montreal, and Toronto also to some extent. The streets of Ottawa were in complete darkness during three nights, but Montreal suffered the most. Traffic was completely stopped on one day in Montreal, and for several hours communication with the outside world by telegraph was cut off.

Surveys are to be made during the year with a view to developing the water-power in the vicinity of Edmonton for electricity supply. The Grand Rapids, on the Athabasca, 150 miles distant, offer ample power at a cost of about £800,000. The Edmonton Council has just voted £57,000 for immediate extensions to the present steam plant.

Cardiff.—The Corporation has under consideration the question of the supply of electrical energy to the Bute Docks. Sir Wm. Thos. Lewis wished to meet one or two members of the Electrical Committee, who would have the power to definitely settle terms, as he desires an early settlement in view of the prospective combine of the Bute Docks with the Taff Vale and Rhymney Railways. At the meeting of the committee Mr. Arthur Ellis, the electrical engineer, emphasised the importance of securing a day load, because at present much of the Corporation's valuable plant was lying idle. A small committee has been appointed, with Mr. Ellis, to meet Sir Wm. Thos. Lewis.

Continental Notes.—Italy.—A hydro-electrical works will be completed in March next on the Dezzo torrent in the Province of Brescia. Three machines are being installed, each of 1,500 H.P., for industrial purposes.

The Electrical Co., of Lijuria, has completed a scheme for extensive hydraulic works in the valley of the Aveto, and a lake is to be formed that will contain 54,000,000 cb. metres of water. A fall towards the Mediterranean of 750 metres is possible, and about 25,000 H.P. of machinery will be installed. The Italian Government reserve an immediate call on 5,500 H.P. for the purposes of the railway service between Genoa and Spezia.

Sweden.—Whilst Stockholm is making preparations to utilise the Jamms and Kvarn waterfalls on the Dal River, another big project has just been put forward with the object of acquiring the other waterfalls in the same river for electrical purposes. Among the principal consumers will be several suburbs of Stockholm, Vöstmanlag Mining Co. and the whole Province of Södermanland, where waterfalls do not exist. The promoter of this scheme is the Jyttbo Water-power Co., who are owners of the large Jyttbo waterfall and others.

Norway.—The municipality of Elverum has made a survey of the Skjesstad waterfall, with a view to erecting plant for the transmission of electrical power. The total sum required for this purpose will be between £45,000 and £48,000, and the waterfall is estimated to be capable of producing about 2,600 effective H.P.

Austria.—A French company, domiciled at Agram, contemplates setting up a large power station on the River Gacka, at an expenditure of 20 million kronen, to supply the whole of the Croatian and Austrian coastlands with electrical power.

Germany.—The plans have been prepared, and only await official sanction, for the construction of a huge dam across the Regen Valley near Teisnach, Bavaria. Something like 200,000 H.P. for electrical purposes is expected to be provided by the scheme.

Among the numerous large and small electrical schemes which are being daily launched in Germany, the more noteworthy are that of Weissensee, for the service of 45 localities with light and power; that at Burgel (S.A.), for the supply of the same number of localities; Dürenberg, six localities; Nürnburg, seven localities; Meissen, on the Elbe, for the localities within a radius of 10 km.; and Butzbach, in Hesse, five localities.

The T.C. of Rosenheim has decided to carry out a hydro-electric scheme on Lakes Chiem and Sim, at a cost of £75,000, the plans for which have been drafted by Chief Engineer Weiss. It is proposed to utilise the falls, 70 ft. high, near Rosenheim, and two sub-stations will be built, whence power to the extent of 3,500 H.P. will be obtained. The current generated will be distributed to light and power consumers throughout the whole of the Chiem district.

Dublin.—The agenda sheet of the North Dublin Union for this week includes the consideration of a report of the committee of the board which has inquired into the question of the lighting of the Union. The report recommends the lighting of the Union by electricity, and that a loan of £2,000 for 20 years be applied for, for carrying out the scheme at once.

Dundee.—The tramway manager has been asked to prepare a report on the cost of a trackless trolley experiment from High Street by the Esplanade to Ninewells. The Tramway Committee favours the proposal, but it is thought such a service should only be continued during the summer months.

East Ham.—The Electric Lighting Committee reports having received a letter from the West Ham T.C. asking whether, as East Ham is not contemplating giving a supply in the area south of the docks, any objection would be raised to West Ham carrying its cables through and giving a supply to certain power applicants. The East Ham Electric Lighting Committee, having fully considered the matter, has decided in favour of no objection being offered to West Ham doing as proposed, provided it agrees to pay the nominal rental of £10 per annum and subject to its entering into an agreement.

Falkirk.—The Corporation has come to an arrangement with the Falkirk Iron Co. to supply electricity to its works. The supply is expected to average 450 H.P. Several of the other iron foundries in the district are making inquiries with the view to installations.

Some time ago the Scottish Central Electric Power Co. applied to the T.C. for permission to erect overhead high-tension lines through the streets of the burgh—a request which the T.C. refused, suggesting the putting of the cables underground. At the last meeting of the T.C. the company renewed the application for overhead wires, but the T.C., by the casting vote of the chairman, decided to adhere to its original decision.

Hull.—The L.G.B. has sanctioned a Corporation loan of £11,185 for electric lighting purposes. The amount originally asked for was £24,000, but the inspector pointed out that he had recommended the reduction of the amount. In reducing the amount, an item of £625 for contingencies was withdrawn, also £751 for a booster required for a Hull firm's works, and £650 for a spare armature, this being an item the Board never allows. Other items having been modified, £12,815 was struck out of the original amount applied for.

India.—According to the *Indian and Eastern Engineer*, the Madras Electric Supply Corporation station, near Basin Bridge, which will contain machinery capable of developing 5,000 H.P., is nearing completion. Four out of the five engines which the northern room is to contain are now in position; the boilers have been erected; and the work of fitting up and fixing the pumps, water storage tanks and the necessary pipes is being rapidly proceeded with. The switchboard, from which the electric supply to the city will be controlled, is nearly complete, and all the street cables have been led into the building and connected up. The erection of the alternating current machinery is not so far advanced. It is expected that the supply for lighting the streets, houses, &c., in Egmore and Georgetown and the Mount Road will be available by the end of the month at the latest, and that for Royapettah, Mylapore and elsewhere by the end of April next.

SIMLA.—Work on the electric lighting scheme has been commenced. The posts and wires, to light the Town Hall and the portion of the Mall between the United Service Club and the Town Hall, have been erected.

King's Lynn.—The work of replacing the carbon-filament street lamps by metal-filament lamps is being gradually carried out. Under the new arrangement a 50-C.P. 200-volt lamp will be used normally for each post, but 100-C.P. lamps are to be fitted at special points. Sixteen street arc lamps have now been replaced by clusters of metal-filament lamps.

Littleborough.—The U.D.C. has concluded arrangements with Rochdale T.C. for a supply of energy in bulk, the charge to be the average total cost per B. of T. unit sold (revenue charges, plus interest and sinking fund), plus 10 per cent.

Liverpool.—The returns of the Electric Supply Department for the year ending December 31st, 1908, show a total revenue of £273,874, and after meeting working expenses, the gross profit amounted to £154,609. This sum, together with £577 accrued interest, was allocated as to interest on loans, &c., £61,859, contribution to sinking fund, £50,474; reserve fund, £11,427; renewal fund, £11,427; and contribution to general rate, £20,000. The reserve fund stands at £147,957, and the renewal fund, after deducting £6,555 for renewal of meters, mains, machinery and buildings, remains with a balance of £102,509. The total capital expended amounts to £2,050,103.

London.—STEPNEY.—It is proposed to install a "Fumicide" smoke-preventing apparatus for one boiler at the Osborn Street generating station, to test its efficiency, at £120. The B.C. is to apply to the L.C.C. for a loan of £10,000 for electricity purposes on account of the £20,000 already sanctioned.

The new generating station in course of erection at Limehouse will measure about 290 by 132 ft., and the designs contemplate two 1,000-KW., four 2,000 and three 6,000-KW. alternating sets, taking steam from 23 boilers of the marine type, and fed by chain grate and underfeed stokers. The portion of the building now being constructed measures 90 by 132 ft.; the permanent walls are of 6-in. reinforced concrete. The first instalment of plant will include two 1,000-KW. and two 2,000-KW. turbo-generators of the Parsons type, running at 1,500 R.P.M.; the former machines are now temporarily installed at the Whitechapel station, and consists of two 500-KW. generators in tandem, to supply either three-phase or direct-current, or both. Four boilers have already been purchased from Messrs. Babcock & Wilcox. The wharf will be provided with a continuous bucket conveyor to take coal from the barges by means of an electric grab; the conveyor will deliver to overhead bunkers of the ordinary type, and will also remove the ashes to the wharf. Circulating water will be supplied by two 3-ft. pipes extending 150 ft. into the bed of the river. It is estimated that the first instalment of plant will be ready for operation in about eight months' time.

Some misunderstanding appears to have arisen as to the closing of the Waldorf Theatre on Saturday last, this being attributed to a failure in the electric supply. This theatre is included in the 30 theatres and halls supplied by the Charing Cross Co., each of which is provided with two independent supplies from separate generating stations, and the company states that no failure of their system occurred.

Loughborough.—The T.C. has received from the L.G.B. sanction to a loan of £1,365 in respect of excess expenditure. As to the loan for services for the next two years, the Board's decision is deferred pending the report of the expert, engaged by the T.C., upon the working of the undertaking. The Board also suggests that there should be no further expenditure on capital account pending the result of the investigation.

Macclesfield.—Owing to the necessary deposit not having been made, the application of the Macclesfield E.L. and Power Co., Ltd., for a prov. order for electric lighting will not be proceeded with. At the March meeting of the T.C. the E.L. scheme prepared by Mr. J. H. Woodward in July, 1905, will be further considered.

North British Power Syndicate.—At the conference in Glasgow last week in regard to the proposals of the above syndicate, all the municipalities authorised to undertake the supply of electricity were represented.

Lord Provost McInnes Shaw, Glasgow, who presided, held that the proposals of the syndicate constituted a serious menace to municipalities which had expended large amounts of capital in providing the necessary buildings and plant to enable them to supply electricity.

The proceedings were private, but we understand that resolutions were unanimously adopted, one being to the effect that the municipalities combine in taking action in the matter, and approach the B. of T., legal action to be taken, if necessary.

A committee, consisting of the Glasgow, Edinburgh, Dundee, Aberdeen, and other representatives, was appointed to arrange as to approaching the B. of T., probably with the Municipal Electrical Association and County Councils interested, with a view to compelling the syndicate to withdraw or placing restrictions on its operations.

Rugby.—A proposal to convert the street lighting from gas to electricity came before the U.D.C. on February 3rd, and was deferred for further consideration. The cost of lighting the 520 lamps by electricity was estimated at £1,523 per annum, against £1,709 paid to the gas company, and the cost of cables, &c., necessary for the conversion, £5,588.

South Stoneham.—The R.D.C has consented to Southampton T.C. obtaining powers to supply electricity in Bassett, Southampton having agreed to a clause directing that two years' notice shall be given to sell the undertaking if the R.D.C. desires to acquire it.

Swindon.—The T.C. has decided to install additional plant at the generating station at a cost of £805.

Tipperary.—The Board of Guardians is considering a project for lighting the workhouse with electricity.

Tiverton.—At Monday's meeting of the T.C., a letter was read from Dr. J. A. Purves, Exeter, submitting the heads of a suggested agreement between the Council and himself regarding the proposed installation by him of electric light works. The draft agreement provided for the erection of generating plant, and laying underground mains within 18 months from the signing of the agreement. It would be agreed that the charge for electricity for lighting purposes should be the same as that for gas. This would be arrived at by calculation, and the price worked out on the basis of equal cost for equal candle-power. In the event of the Council either reducing or increasing the charge for gas lighting, the undertaker would have to do the same. The Council have the option of purchasing the whole undertaking at the end of 15 years, at valuation as a going concern, such valuation to include goodwill. Any dispute or difference is to be referred to arbitration under the Arbitration Act of 1899. The matter was deferred for a month.

Walmer.—The B. of T. has informed the U.D.C. that it will temporarily defer consideration of the revocation of the E.L. order, and has asked to be informed of the decision arrived at in the matter by the Council. When the question came before the Council on February 3rd it was stated that the hopes of the Council that someone would take over the order had not been realised.

Walsall.—The balance-sheet of the Corporation electricity undertaking for the year ended December 31st has been presented to the Electricity Committee. It shows a loss of £856 12s. as compared with a loss of £89 for the previous year. This is accounted for largely by the increased charges which the Committee had to pay for coal and the increased charges in respect of interest and sinking fund in consequence of the increase of capital. This loss the Committee propose to provide for by the transfer from the reserve fund to the revenue account of an equivalent sum.

Whitby.—A debate, which came as a surprise, took place at the last meeting of the Urban Council. A resolution came forward from the General Purposes Committee, recommending that the clerk should write to the B. of T., asking whether, in the event of the Council deciding to sell or lease its undertaking, it would meet with the approval of the Board. Councillor Reynolds vigorously opposed any idea of sale or lease, saying that now, when the Council were embarking upon a large scheme for improving the harbour, and a new bridge was being built over the river, there was a chance of the undertaking doing better. He proposed that no such letter be sent, and the clerk advised that it was no use asking about sale, as it was not possible. The chairman (Councillor H. Walker, C.C.) said the question of sale never arose, but leasing was certainly thought of. Councillor Reynolds said he was against sale or lease in any form; and his resolution was eventually carried unanimously.

Westhoughton.—The Lancashire Electric Power Co. has written to the Council stating that the directors could not see their way to admit the Council's claim for interest from 1905 on the cost of procuring the electric lighting order, and basing their authority on a clause in the 1907 agreement.

E

TRAMWAY and RAILWAY NOTES.

Australia.—The Adelaide tramways are practically completed, and an official test of certain routes has taken place. The work has been carried out by a tramway trust representing the Government and municipal authorities, Mr. W. G. T. Goodman acting as chief engineer.

Bournemouth.—The outcome of Mr. Hamilton's report on the Corporation's tramway undertaking and its management—which report, it may be remembered, followed on one by Major Pringle, and which has also been the subject of counter reports by Mr. Barber, the engineer and traffic manager; Mr. J. Bulfin, the borough electrical engineer; and Mr. Lacey, the borough engineer—is that the Committee will at once proceed to the appointment of a general manager by open competition. On the matter of relaying the rails, and increasing the super-elevation, this work will be proceeded with as soon as possible. The Tramways Committee's original proposal at the meeting contained five clauses, the first four proposing that Mr. Barber be appointed general manager at his present salary for a year, with Mr. Hamilton as consultant for the same period, and that the salary of the electrical engineering assistant be £200 per annum, of which notice was to be given to Mr. Bulfin. Mr. Barber, however, expressed a preference for open competitive appointment, and the chairman (Alderman Banks) having expressed some doubt as to the wisdom of the recommendations, Councillor Bell, in a lengthy speech, criticised the latter, and moved an amendment deleting the four clauses mentioned, and proposing that the Committee at once proceed to the appointment of a general manager by open competition. This amendment was carried.

Colchester.—Seven weeks ago the T.C. raised local tramway fares by 100 per cent. on main routes and 50 per cent. on branch lines. It has now been decided to make substantial reductions, as owing to the public boycotting the system, 11,485 fewer passengers per week have been carried.

Continental Notes.—Italy.—A company has been formed in Lugano, with a capital of £20,000, for the purpose of constructing and working an electric tramway from Lugano to Cadro and Dino.

Holland.—Referring to the long-talked-of project in connection with the establishment of a system of electric tramways at Groningen, it is stated, on the authority of the Belgian Consul in that town, that the matter is on the eve of consummation, and that the municipal authorities are arranging for the supply of cars, rails, &c.

Austria.—The Austrian Government is seriously studying the problem of the electrification of the railways in the Tyrol, in view of the abundance of water-power, which can be obtained at little cost from falls of very considerable altitude, whilst, on the other hand, coal in the district is extremely expensive. The present intention is to leave the construction in the hands of private companies and to purchase energy from them on the best conditions that can be arranged.

Germany.—The scheme for extending the existing underground railway Spittelmarkt-Charlottenburg by way of Wilhelm Platz to the north of Charlottenburg and the north-west of Berlin has entered upon a new stage. It is stated that, as the extension would be the means of opening up a district which is only partly built upon, the town of Charlottenburg proposes to make a contribution of £105,000 towards the cost of construction, and as the landowners would derive advantage from the railways, they are being asked also to make contributions towards the same purpose.

The electrification of the railway lines in the Moselle Valley is to be shortly carried out. The State railway administration has decided to make a beginning with the section from Treves to Bullay, after which will be taken in hand the Treves to Türkismühle section through the Hochwald.

Sweden.—Referring to the electrification of the Swedish frontier State railway, Director-General Pegelow recently stated that if the railway income and outgoings merely balanced, there would still remain a yearly saving of 25,000 tons of coal on the present consumption. Reckoning a ton of coal at 15 kroner this equals a saving in the coal imports of 375,000 kroner. The electric power station will be built on the Torne Elf, and regulating reservoirs will be constructed near Tarakoski and Vakakoski. Near the latter place will be situated the power station, the cost of which is roughly estimated at between 5 and 6 million kr. The outlay on the transmission lines and rolling stock will probably be 8,000,000 kr. There is a steady ore traffic from Kiiruna to the frontier of 1,600,000 tons a year, which will presently be increased, by contracts in course of arrangement, to 3,750,000 tons a year. The success of the scheme is thus assured.

Eccles.—The T.C. on Friday resolved to proceed with its action against the South Lancashire Tramways Co., unless the Salford Corporation agrees to apply in writing for the consent of the Eccles Corporation to the cars of the company running on the Corporation's lines between Alder Forest, Worsley and Parrin Lane, Winton, or agrees to the terms suggested at the last meeting of the General Purposes Committee.

Gateshead.—At a meeting of the T.C. on the 3rd inst., the Town Improvement Committee recommended that the Council petition against the Gateshead and District Tramways Co.'s Parliamentary Bill. The latter, it was reported, sought power to construct additional tramways in the borough. With some slight amendments it gave effect to the agreement between the Tramways Co. and the Corporation dated November 17th last, but it also included further provisions outside that agreement, and those provisions would, if granted, modify or limit the powers of the Council in regard to the tramways; the Council is to oppose these provisions. At a meeting of the Newcastle-on-Tyne City Council on the same date, reference was also made to the matter, and the Tramways Committee expressed the opinion that "powers should not be granted to the owners of an adjoining tramway undertaking to extend that undertaking into the city without the Corporation's consent, and that the obtaining of such powers would be injurious to the Corporation, and they recommend that the Bill be opposed," which was agreed to. Our correspondent states that it has been currently rumoured that there was a suggestion under consideration for a system of tramways to be run between the terminus of the Gateshead system and the central station of the North-Eastern Railway Co. The distance is probably about a mile, and the *raison d'être* for the origination of such a service seems to lie in the fact that the major proportion of the important trains going between north and south, although they pass through Gateshead, do not stop at that station, a matter that has long been a grievance with the residents on the south side of the Tyne.

Glasgow.—The T.C. recently received a deputation from the Kirkintilloch T.C., when the latter requested that the Glasgow tramways should be extended from the present terminus at Bishopbriggs to Kirkintilloch, a distance of three miles. The Glasgow Committee on Extensions will consider and report on the matter.

The superintending engineer of the Post Office telegraphs has withdrawn his application for permission to use the tramway poles for telegraph wires.

India.—An electric tramway for Lahore is on the tapis. The Municipal Committee at its last meeting discussed the subject and resolved to send the papers to the local Government for approval. The residents are anxious that the scheme should make headway, and there is every probability of its being sanctioned.—*Indian and Eastern Engineer.*

Japan.—The Joshin Electrical Tramway Co. has projected a line from Takasaki to Uyeda station on the Government Shinetsu line, a total length of 70 miles.

Leeds.—Some little excitement has been caused in local circles by a resolution submitted by Mr. Badley to the T.C., reflecting on Mr. J. B. Hamilton, the tramways manager, and proposing that his salary should be reduced to £700 per year. Mr. Smithson, chairman of the Tramways Committee, defended Mr. Hamilton's actions, pointing out that he had obtained the consent of his Committee to carry out private work of a consultative character, and that he had severed his connection with the Electro-Mechanical Brake Co., of which he had been a director, being one of the patentees of the brake which the firm were putting on the market. Ultimately a vote of confidence in the manager was carried by 30 votes to 3, this disposing of Mr. Badley's resolution. Mr. W. H. Brown moved a further amendment to refer the matter to a committee to inquire and report. This, however, was defeated by 26 votes to 14.

The Tramways Committee has had under consideration the ordering of 30 mechanical and eight magnetic track brakes from the Electro-Mechanical Brake Co., at a cost of £3,000. After considerable discussion, in which Mr. Hamilton's recent connection with the company was mentioned, the minutes were passed.

London.—The L.C.C. has been recommended by the Highways Committee to purchase from the Metropolitan Electric Tramways, Ltd., the portion in London of the undertaking authorised by the Harrow Road and Paddington Tramways Acts, for £42,000.

It is recommended that £2,000 be spent on supplementing the magnetic brakes on 65 cars by mechanical attachments, the cars in question being used on hilly routes.

Nelson.—The Burnley T.C. has given notice that it will require a revision of the rent of the electric tramways from March 31st, and of the price of electricity; a sub-committee has been appointed to consider and report upon the question.

New South Wales.—Sydney.—The installation of the additional machinery at the tramway power house, Ultimo, is being pushed forward. The present plant consists of four engines, with direct-current generators of 850 kw. capacity each; three vertical engines, with alternators of 1,500 kw. output each, and a Parsons turbo-alternator of the same capacity, making a total of 6,000 kw. of alternating-current plant. Thus the total full-load capacity of the present power house is 9,400 kw., but for some time past it has been worked considerably above its nominal output. The first of the two Parsons turbo-alternators of 5,000 kw. capacity each that were ordered a long time ago is now installed.—*Australasian Hardware and Machinery.*

Walsall.—The annual statement of accounts in relation to the Corporation tramway undertaking, for the year ended December 31st, shows a net profit of £3,680, as against £4,305 for the year 1907, and the Committee recommends that this sum, from which has been deducted £514, being one-fifth of the cost of five new cars which have been provided, shall be carried to the reserve fund. This result, the Committee feels, is satisfactory when the state of the trade during the past year is taken into consideration, and reflects credit on the management.

TELEGRAPH and TELEPHONE NOTES.

China.—The Great Northern Telegraph Co., at the request of the Chinese Administration, has opened to international correspondence 16 new telegraph offices.

Military Radio-Telegraphy.—Experiments are being conducted at Bracciano with radio-telegraphic apparatus of a specially portable nature, the transmitting and receiving apparatus weighing about 150 kg. With a 4½-H.P. engine set an alternating current is generated, and a distance of 100 km. is covered between the transmitting and receiving stations, whilst messages have also been received from places further distant.

New Cables.—The Spanish Administration has notified the laying of new submarine cables between Cadiz and Santa Cruz de Teneriffe, 765·122 n.m.; Garachio and Santa Cruz de la Palma, 72·668 n.m.; Port Hierro and San Sebastian (Gomera), 55·718 n.m.; San Sebastian (Gomera) and Tejita (Teneriffe), 39·809 n.m.; Santa Cruz de Teneriffe and Las Palmas, 56·299 n.m.; Las Palmas and Puerto Cabras (Fuerteventura), 154·022 n.m., and Puerto Cabras (Fuerteventura) and Arecife, 40·461 n.m.

Telegraph Interruptions and Repairs:—

	Interrupted.	Repaired.
Port Arthur-Chifu	March 9, 1904	
Pontianak-Saigon	Sept. 16, 1908	
Malta-Zante	Dec. 29, 1908	
Falmouth-Bilbao	Jan. 19, 1909	Feb. 3, 1909
Tourane-Amoy	Jan. 19, 1909	

U.S.A.—It is reported that a Bill will be introduced in the Upper House early in the present Session of Congress having for its object the placing of the telegraph and telephone companies of the country under the authority of the Inter-State Commerce Commission, with a view to bringing them under federal control.—*Telegraph Age.*

The United Wireless Telegraph Co. has received an order for 250 complete sets of wireless instruments, which are to be used for installations to be established in cities east of the Mississippi River. The majority of the stations will be of one or two kilowatt capacity with a range from 100 to 300 miles; but others will have a range of from 500 to 2,000 miles overland and from 1,000 to 3,000 over water. It is hoped to have the stations in working order during this year. Other extensions on the Pacific side are also in contemplation.—*The Aerogram.*

The interruption of the United States cable between Seattle and Sitka is stated to have been due to an earthquake.

Wireless Telegraphy.—Marconi's Wireless Telegraph Co., Ltd., have received a contract from the Norddeutscher Lloyd Shipping Co. to equip nine of their steamers with the Marconi apparatus.

In order to form a reserve of operators in wireless telegraphy, the Admiralty have decided to allow telegraphist ratings to enrol in the Royal Fleet Reserve on completing their first continuous engagement. They will be required to follow their trade of wireless telegraph operator in civil life. In order to improve the chances of telegraphist ratings obtaining civil employment on leaving the service, it has been decided that they may present themselves for examination by the Post Office authorities for the grant of a certificate in commercial wireless telegraphy.

The Government of Morocco, in agreement with the French Government, announces that systems of wireless telegraphy have been installed between Tangier, Rabat, Casablanca and Mogador, and that this means of communication is to be regarded as an extension of the ordinary telegraph system.

A Reuter telegram states that President Roosevelt has sent a message to Congress recommending immediate legislation requiring that, within a reasonable time limit, all ocean-going steamships carrying considerable numbers of passengers shall be equipped with wireless telegraph apparatus.

Wireless Telegraphy in the Merchant Service.—A correspondent writes that the *Republic* incident is responsible for a good deal of rather foolish talk about the necessity for all merchant ships being fitted with a system of wireless telegraphy. No doubt a small installation could be put up at comparatively little cost, but the necessity for trained operators and a constant watch to be kept at the instruments is not likely to appeal to the majority of shipowners. If wireless communication is to come in generally on board ship, it will have to be in some simple form, such as the modern telephone. A call-bell fitted in the chart-house will give notice to the officer on watch that some ship wishes to communicate with him; he will then ring up in reply and receive a telephonic message. Wireless telephony has not yet arrived at this stage, and at present he would find his bell ringing almost continuously throughout the day when in the neighbourhood of a wireless station. Wireless telephony and telegraphy will have to advance very considerably before such a scheme becomes practicable.

CONTRACTS OPEN and CLOSED.

OPEN.

Abertillery.—February 26th. Two 66-KW. vertical gas engines and dynamos, suction gas plant, balancer, booster, pipework, switchboard, poles and overhead conductors, cables, feeder and other pillars, and public lighting apparatus, for the U.D.C. See "Official Notices" to-day.

Acton.—February 16th. Meters and materials for the U.D.C. electricity department for one year. See "Official Notices" February 5th.

Ashton-under-Lyne.—March 3rd. Water-tube boiler and engine-driven induced draught fan for the Electricity Department. See "Official Notices" to-day.

Australia.—QUEENSLAND.—Telephone material for the Postmaster-General's Department. See "Official Notices" January 22nd.

Austria.—EBENSEE.—February 20th. The Imperial Salt Mines at Ebensee are to be equipped with an electric installation for shunting wagons by means of wire ropes. Tenders will be received by the K. R. Salinen-Verwaltung.

Blackburn.—February 16th. Stores for the Electricity and Tramway Committee. See "Official Notices" January 29th.

Bolton.—March 1st. Stores for the Tramways Department. See "Official Notices" to-day.

Brighouse.—March 2nd. Balancing set, feeder cables, switchboard, &c., for the Corporation. See "Official Notices" to-day.

Canada.—March 1st. Boilers, economiser, feed pump, mechanical draught, pipework, steam turbo-generator, steam engine generator, re-erection of steam engine, condensing plant, crane, switchboards, motor-generators and transformers, buildings, steelwork, &c., for the City of Lethbridge, Alberta. Tenders to the City Hall, Lethbridge. 10 per cent. of tender amount as deposit. Plans and specifications from Smith, Kerry & Chace, Confederation Life Building, Toronto, and the Carnegie Public Library Building, Winnipeg.

Cardiff.—February 19th. Two 300-KW. motor-alternators for the Corporation. See "Official Notices" February 5th.

Chelmsford.—February 19th. Maintenance and repair of the electrical fire alarm system for the T.C. W. Smith, Town Clerk, 16, London Road, Chelmsford.

Clacton.—February 17th. Overhead travelling crane for the U.D.C. electricity works. See "Official Notices" January 29th.

Dundee.—The Corporation invite offers for the sole right of advertising on their tramway cars. Applications to Mr. Peter Fisher, the Manager.

Edmonton.—February 24th. Electric light and power installation for the new infirmary. See "Official Notices" to-day.

Elham.—March 11th. The lighting of the workhouse at Lyminge, near Folkestone. See "Official Notices" to-day.

Esher.—March 3rd. Wiring for electric light of the sewage disposal works, Lower Green, for the U.D.C. Surveyor.

France.—ANOR (NORD).—The municipal authorities are at present inviting tenders for the concession for the lighting of the town by gas or electricity.

Gillingham.—February 18th. Cable and general stores for the T.C. for the year. J. L. Redfern, Borough Engineer.

Holland.—THE HAGUE.—February 17th. The P.G.M. (Administration Supérieur des Postes et Télégraphes) requires tenders for a quantity of telegraph material.

Hornsey.—March 8th. Meters, cables, troughings, &c., for the T.C. See "Official Notices" to-day.

Ilford.—February 23rd. Meters and other stores for the U.D.C. electricity works. See "Official Notices" February 5th.

Italy.—FRANCAVILLA FONTANA.—February 26th. The municipality invites tenders in connection with the electric lighting of the town. The upset price is placed at 126,800 lire (about £5,080), and a provisional deposit of 6,000 lire (£240) will be required to qualify any tender, to be increased to 12,700 lire (£508) by the successful tenderer. Tenders to the "Amministrazione Municipale, Francavilla Fontana, Italy."—*Board of Trade Journal.*

Leeds.—February 25th. Stores for the Corporation Electrical Department. See "Official Notices" January 29th.

February 20th.—Coals and materials for the Tramways Committee. Mr. J. B. Hamilton, General Manager.

London. — Bermondsey. — February 15th. Various materials for the Council's electricity and destructor works. See "Official Notices" January 22nd.

Battersea.—March 2nd. Materials for the B.C. Electricity Department. See "Official Notices" to-day.

Brixton.—February 16th. Electric light and bell installation at the School of Building (Extension), Brixton, S.W., for the L.C.C. See "Official Notices" February 5th.

L.C.C.—February 24th. Electric lighting, bells and fans at the Trade School for Girls, Queen's Square, Bloomsbury, for the L.C.C. See "Official Notices" to-day.

L.C.C.—March 9th. Two 1,500-kw. rotary converters, and for six 575-kw. static single-phase transformers for the Elephant and Castle tramways sub-station; switchgear; electric light wiring for Norwood tramways car-shed. See "Official Notices" to-day.

Marylebone.—February 16th. Stores for the Council's electricity department. See "Official Notices" January 22nd.

February 17th. Electric fittings, reflectors, switches, &c., for about 2,000 existing street lanterns for the B.C. See "Official Notices" February 5th.

Stepney.—February 17th. Electric light installation at Redman's Road Elementary School, for the L.C.C. See "Official Notices" January 29th.

Stepney.—Steam coal and coke for the B.C. from April to July.

Stepney.—February 25th. Condenser pipework (partly subaqueous) settling tanks, valve chamber, and river wall, at Blyth's Wharf for the extension scheme. Borough engineer, Mr. M. W. Jameson. Deposit £5 Bank of England note.

February 26th.—Combined high and low-tension switchboards; low-tension d.c. switchboard and battery boosters for the Westminster Electric Supply Corporation, Ltd., at Horseferry Road station. See "Official Notices" to-day.

Lowestoft.—The E.L. Committee has instructed the electrical engineer, Mr. G. A. Bruce, to obtain tenders for a new 250-kw. combined set.

Manchester.—February 16th. Three electric motors for the Chorlton Union Guardians for the Workhouse at West Didsbury. D. S. Bloomfield, Clerk to the Guardians, Union Offices, All Saints', Manchester.

Middlesbrough.—Transporter bridge over the Tees, for the T.C. A. Sockett, Town Clerk.

Newport (Mon.).—February 23rd. Three four-wheeled double-deck tramcars for the Electricity and Tramways Committee. See "Official Notices" February 5th.

Portsmouth.—February 15th. Coal, also various stores for the Tramway Committee for one year. See two "Official Notices" January 29th.

Radcliffe.—March 2nd. 300-kw. steam dynamo, 100-kw. motor-generator, booster, condensing plant, piping and switchboard extensions for the U.D.C. See "Official Notices" to-day.

Sheffield.—February 15th. Steam and feed piping, valves and connections, water meter, and ironwork for a new boiler at Neepsend electric power station. See "Official Notices" February 5th.

Salford.—February 15th. Stores for the Electricity Department. See "Official Notices" February 5th.

Southampton.—February 17th. Sundry cable, also 1,000 tungsten lamps for the Corporation Electricity Department. See "Official Notices" to-day.

St. Helens.—February 17th. Condensing plant and other work at Cropper's Hill power station for the Electricity Committee. See "Official Notices" February 5th.

Stockport.—March 1st. New distributing mains at Stepping Hill Hospital, for the Guardians. See "Official Notices" to-day.

Wimbledon.—March 4th. Stores, &c., for the Corporation electricity department. See "Official Notices" to-day.

CLOSED.

Beckenham.—Subject to an adjustment in respect of the price of lamps included, and to all three contractors being willing to accept the price of the lowest for each item, the U.D.C. has accepted the tenders of the following firms for free wiring for a period of 12 months:—Messrs. Buchanan & Curwen, H. W. Tyler, and Oscar Jones & Co.

Blackpool.—Messrs. Lomax, Kendal & Co., of Manchester, have secured the contract for the electric light installation at the extensions at the North Pier.

Bradford.—The tender of the Keighley Electrical Engineering Co., Ltd., for two electric passenger lifts for the new Town Hall extension at Bradford, at £694, is recommended for acceptance.

The City Council is recommended to accept the tender of Messrs. Ashwell & Nesbit, Ltd., for electrical work required at the Green Lane Child-Feeding Depôt, at £94.

The T.C. has accepted the tender of the North-Eastern Steel Co. for a mile of temporary tramway track for use during renewals, at £936.

Dudley.—The T.C. has accepted the tender of the Electrical Co, Ltd., for the supply of 25 meters, at £48.

East Ham.—An order has been placed by the T.C. with Messrs. Mathews & Yates for a new set of fans required for a cooling tower at the generating station, at £51.

Gillingham (Kent).—The T.C. has accepted the tender of Messrs. A. Davenport & Son for two electric geysers at the Infectious Hospital.

Glasgow.—The T.C. Tramways Committee has accepted the following tenders:—

Wattmeters for Pinkston.—Ferranti, Ltd.
D.C.C. wire.—British Insulated and Helsby Cables, Ltd.
Lead-covered cables.—National Conduit Cable Co., America.

The last offer was the lowest, and a motion to accept the lowest home firm order was defeated in Committee.

The T.C. Committee on Galleries has accepted the offer of the Corporation electrical engineer to substitute 200-c.p. Osram metallic-filament lamps for the existing arc lamps under the dome of the People's Palace.

Harrogate.—The Education Committee has accepted the tender of Mr. Barker, at £215, for the electric lighting of a number of schools.

Leeds.—The T.C. has accepted the tender of the Electro-Mechanical Brake & Engineering Co., Ltd., West Bromwich, for 30 mechanical and magnetic track brakes for tramcars, at £3,000.

Lowestoft.—The T.C. has accepted the tender of Messrs. Siemens for meters as follows:—Two-wire 230-volt 3-ampere, and two-wire 230-volt 5-ampere, £1 8s. each; two-wire 230-volt 10-ampere, £1 10s. each. The tender of Messrs. Venner & Co. was accepted for the following meters:—Three-wire 460-volt 10-ampere, £2 5s. each; ditto 25-ampere, £2 10s. each; ditto 50-ampere, £2 14s. each; ditto 100-ampere, £3 3s. each.

Maidstone.—For a new switchboard the T.C. received the following tenders:—

Drake & Gorham .. (accepted)	£54	Reyrolle & Co.	£66
Universal Electrical Co.	78	Veritys, Ltd...	66
Stevens, Ltd.	73		

Nelson.—At the T.C. meeting on February 4th the chairman reported what arrangements he and the electrical engineer had made with Messrs. Brooks & Brooks for a supply of coal to the electricity works. The arrangement was confirmed, the tender of the firm being accepted up to March 31st, 1910.

Plymouth.—The Tramways Committee has accepted the tender of Messrs. Bolckow, Vaughan & Co., Ltd., for 120 tons of tram rails, fish-plates and anchor joints, at £8 per ton, delivered *ex* ship to Plymouth.

Russia.—The company which has been entrusted with the contract for converting the tramways in the town of Odessa to electric traction on behalf of the tramway company, has also just secured the concession for the electric lighting of the town.

Sheffield.—The Committee of the Smoke Abatement Exhibition to be held here from March 1st to 20th, have placed the order for the general lighting of the entire exhibition with the Union Electric Co., Ltd. The improved deposit-free Excello lamps are to be used, connected to the Corporation a.c. supply mains.

South Africa.—Cape Town.—The order for a 550-volt battery and Ents booster in connection with electric power supply to the docks, has been placed with the Chloride Electrical Storage Co., Ltd.

Wakefield.—The T.C. has accepted the tender of the British Thomson-Houston Co., Ltd., of Rugby, for meters for a year.

Whitby.—The T.C. has accepted the tender of Callender's Cable & Construction Co., Ltd., for cables.

Wimbledon.—An order has been placed with the British Thomson-Houston Co., Ltd., for the supply and fixing of two bottom bucket wheels and diaphragm nozzles for the Curtis turbo-generator at the electricity works, at a cost of £120.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERCARN (Mon.).—Sewerage scheme, for the U.D.C. (£11,650).

ABERDARE.—Additions and alterations to 88 and 89, Jubilee Road, for Dr. Thos. Finney. J. L. Smith, architect, 7, Victoria Square, Aberdare.

ABERDEEN.—Proposed extension of Training College; Secretary, Provincial Committee for Training of Teachers, Aberdeen. Office and showroom for W. Masson, plasterer; Wm. Beattie, architect. Alterations for Northern Assurance Co.; Brown & Watt, architects, 17, Union Terrace, Aberdeen. New aerated water manufactory in Seaforth Road, for Sang & Co., to cost £1,200.

ACCRINGTON.—Houses, seventeen in Hodder Street, for Thos. Cronshaw; eleven in Aitken Street, for Edward Dixon.

ADLINGTON (Lancs.).—Church school. Ormrod & Pomeroy, architects, Bolton.

ALDERSHOT.—Proposed new Church for Presbyterian soldiers.

ALTRINCHAM.—Infectious Diseases Hospital, for the U.D.C. (£11,300). Wm. Owen, architect, Clarence Street, Manchester.

ASHTON-UNDER-LYNE.—Extensive alterations to business premises for Leigh & Ashton, 183-5, Stamford Street.

ASPULL (near Wigan).—New school for Lancs. C.C. (£3,920).

ATHERTON (Lancs.).—Eight houses, Leigh Road; A. E. Watson. Workmen's dwellings; Surveyor, Council Offices, Atherton.

AUDENSHAW (near Manchester).—Fifteen houses, Stamford Road. J. H Burton & J. A. Percival, architects, 150A, Stamford Street, Ashton-under-Lyne.

BACUP.—Post Office, Burnley Road (£10,000). J. W. Else, borough surveyor, Bacup.

BANBURY.—New Council Schools at Grimsbury. J. W. Fisher, architect, Market Square, Wellingborough.

BANFF (N.B.).—Additions and alterations to Blacklaw School. J. Christie, jun., architect, Banff.

BANGOR (Co. Down).—Prospective rebuilding of the Bangor Steam Laundry and Handkerchief Works (after fire).

BARNSLEY.—Miners' Rest, Old Town (licensed house) to be re-built for the Barnsley Brewery Co.

BARNSTAPLE.—New school, Ashleigh Road, for the T.C. H. Barrett, architect.

BARROWFORD (Nelson).—Factory and works. V. Whitehead, architect, Hall Street, Nelson.

BARROW-IN-FURNESS.—Eight houses in Settle Street; Banks & Co. Eight semi-detached houses, Foundry Street; F. W. Cookson, Duke Street.

BEAMISH (Durham).—School. W. Rushworth, Shire Hall, Durham.

BELFAST.—Proposed Corporation slipper baths. Councillor J. S. Shaw, chairman of the Baths and Lodging House Committee.

BEXLEY HEATH.—New Salvation Army Hall.

BIRKBY (Huddersfield).—School. R. Campbell, borough surveyor, Huddersfield.

BIRKENHEAD.—Enlargement of St. Paul's Presbyterian schools; Rev. T. W. Macpherson, pastor. Laboratory and coal-testing plant buildings for the T.C.

BIRMINGHAM.—New Primitive Methodist Church, schools, assembly hall and institute at Tyseley (£8,000). Passenger station, Snow Hill, for the Gt. Western Railway Co. (£100,000); H. Lovatt, Ltd., builders, Wolverhampton.

(Yardley).—Prospective rebuilding, after fire, of Hay Mill Joinery Works, Berkeley Road, for Messrs. Fairbank, timber merchants and carpenters.

BIRTLEY FELL (Co. Durham).—Two shelters, dining hall, and laundry at the Consumptive Sanatorium, for Chester-le-Street R.D.C.; J. H. Mole, surveyor, Union Offices, Chester-le-Street.

BISPHAM (near Blackpool).—Proposed new Congregational church.

BLACKPOOL.—Carnegie free library, to be lit by electricity (£12,498); Alec. Cullen, Lockhead & Brown, architects, Hamilton, Scotland. Brick works for R. Fielding & Sons. Proposed additional municipal offices; borough engineer, Blackpool. Extension of business premises for Donnelly & Sons, drapers, Church Street.

BLAENAVON.—School; J. Bain, Arcade Chamber, Newport.

BOLTON.—Additions to Convalescent home; Bradshaw & Gass, architects, 19, Silverwell Street, Bolton. Proposed Central Labour Institute. Additions to premises for the Haslam Spinning Co.

BO'NESS (Linlithgow).—Church; M. Steel, Masonic Buildings, Bo'ness.

BOWBURN.—School. H. Gradon, architect, Market Place, Durham; Blackett and Son, builders, Darlington.

BRADFORD.—Additions to Sanatorium. City architect, City Hall, Bradford.

BRANDON (Co. Durham).—Shop premises, New Brancepeth, for Mr. Ellis; houses, Langley Moor, for Mr. Pye.

BRAY.—Public Library, junction of Florence and Eglinton Roads, for the U.D.C. J. C. Wilmot, architect, 3, Lower Merrion Street, Dublin.

BREDBURY (Cheshire).—Eleven houses, Lyme Grove, Romiley, for J. Chorley.

BRIGHOUSE.—New silk mill, engine and boiler houses, &c., at Thornhill Briggs Mill, for Wood Bros. & Sons, Ltd.; Sharp & Waller, architect, 32, Bradford Road, Brighouse. Renovation, after fire, of silk spinning mill; J. Cheetham & Sons.

BRIGHTON.—New premises at Ovingdean for St. Mary's Home (£10,000 to £11,000). Mr. Cawthorn, architect, North Street, Brighton.

BRISTOL.—Salvation Army Hall (£2,704) at Bedminster. Oswald Archer, architect; Thos. C. Gluyas, builder.

BURNLEY.—Bakehouse, 181, Accrington Road; W. Mellor, Accrington Road. Maltrooms at Keirby Brewery; Grimshaw, Ltd., Keirby Brewery. Weaving shed; J. Kay & Sons, manufacturers, Todmorden Road, Burnley.

BURSLEM.—Proposed model bakeries. Burslem Co-operative Society.

BURY.—Extensions at works, Elton Fold, for Mountain & Gibson; proposed additional Municipal Offices, borough engineer, Bury.

BURY ST. EDMUND'S.—New offices at Town Hall. W. D. Harding, borough surveyor, Bury St. Edmund's.

CAMBRIDGE.—Alterations and additions to the Workhouse Infirmary for the B.G. Sidney French, architect, Cambridge.

CAMBUSLANG (N.B.).—Additions to Cambuslang School. Chairman of the School Board.

CANTERBURY.—Rebuilding the Victoria Inn, Castle Street and Wincheap Green; H. Doré, architect, St. Margaret's Street, Canterbury. Head attendant's house at the City Asylum; Jennings & Gray, architects, 4, Margaret's Street, Canterbury.

CARDIFF.—Seven houses in Kimberley Road, for J. H. Leonard, and six houses in Kimberley Road, for J. W. Deans; W. H. Scott, architect, 74, Stacey Road, Cardiff. New bank in Richmond Road, for National Provincial Bank Co; W. H. D. Caple, architect, Church Street Chambers, Cardiff.

CARK-IN-CARTMEL (Lancs.).—Proposed installation of the electric light in Holkar Hall, for Lord R. Cavendish. E. Drewry, agent, Cark-in-Cartmel.

CARRY RIVEL (Somerset).—Additions to Council Schools; G. I. Simey, Bath.

CATERHAM (Surrey).—Additions to the Asylum (£770). W. T. Hatch, engineer, Metropolitan Asylums Board, Victoria Embankment, E.C.

CHAPEL-EN-LE-FRITH.—Proposed new Primitive Methodist Church. Rev. J. Hancock, Hayfield Road.

CHARD.—Workshop for Mr. Page, builder, High Street.

CHATHAM.—Premises, Luton Road. C. E. Skinner, builder, Railway Street, Chatham.

CHERITON (near Folkestone).—Eighteen houses, Sidney Road, for W. G. Church.

CHESHAM.—School. C. Riley, surveyor, Old Church Schools, Aylesbury.

CHILTON.—School (£2,500). C. Johnston, architect, Bishop Auckland; Hope Bros., builders, Coundon.

CHOPWELL (Co. Durham).—Three houses and shops. D. M. Spence, architect, Shotley Bridge.

CHORLEY.—Houses (27), Blackstone Road, for A. Tromans.

CLOGH (Co. Kilkenny).—New R.C. Church. Rev. M. Power, P.P.

COLCHESTER.—County lunatic asylum, Mile End. Curtis & Son, Finsbury Square, London, E.C.

CONSETT (Co. Durham).—Conversion of British Schools into reading and recreation rooms for the Consett Iron Co. Company's architect, Consett.

CORNSAY (Co. Durham).—Probable rebuilding, after fire, of the Workmen's Club and Institute (£3,000 to £4,000 damage).

COULTER (N.B.).—New schools. Mr. MacWhannel, assessor of plans, 58, West Regent Street, Glasgow.

COVENTRY.—Two schools for Coventry Education Authority—Mile Lane (£16,000), Broad Street (£11,500). G. and I. Steane, architects, Little Park Street, Coventry.

COWDENBEATH (N.B.).—New Post Office in Union Street.

CRADLEY HEATH.—Suggested new theatre.

CREWE.—Extension of the Cottage Hospital (£2,100). G. E. Bolshaw, architect.

CROSS KEYS (near Newport, Mon.).—Rebuilding the Eagle Inn (£2,800), for W. Hancock & Co., Ltd., Anchor Brewery, Newport.

CROYDON.—Additions to the Borough Hospital. E. F. Morgan, surveyor, Croydon T.C.

CRUMLIN (Mon.).—Houses (about 500), Sofrydd Estate, for a building company. M. Gorman, Llanhilleth, secretary; David Lewis, builder.

DARLINGTON.—High school for girls; W. Rushworth, Shire Hall, Durham. Rebuilding Holy Trinity Church; C. H. Fowler, architect, The College, Durham.

DARTFORD.—Additions to St. Ursula's Convent, for Mother Gertrude.

DARTMOUTH.—Two villas at Mount Boone, for W. G. Ellis. J. I. Triggs, builder, Newcomen Road, Dartmouth.

DEAL.—Probable re-erection, after fire, of the Antwerp Hotel. Mr. Cunliffe, licensee.

DERBY.—Institute for the Deaf and Dumb (£5,000). A. Eaton, architect, Long Eaton.

DAVENTRY (Northants).—Rebuilding premises, corner of St. John's Square, for J. W. Elliott.

DENTON.—Additions to hat works, Wilton Street, for J. Wilson & Sons, Ltd.

DEREHAM.—Proposed secondary school at East Dereham. B. H. Vores, clerk to the Urban Council.

DEWSBURY.—Nurses' Home for the B.G. W. Hanstock & Son, architects, Batley.

DONCASTER.—Re-construction of Golden Lion Hotel, for Hartley's Brewery Co., Ltd., Cowick, Snaith; Jas. Heseltine, architect, Old Castle Drawing Office, Pontefract. Temperance Hall; F. Chambers, architect, 24, Boothferry Road, Goole.

DORCHESTER.—Cricket pavilion for the Dorchester Cricket Club. P. B. J. Harding, hon. secretary, Cambridge Road, Victoria Park, Dorchester.

DUBLIN.—New dispensary buildings, for the Governors of the Jervis Street Hospital; W. H. Byrne & Sons, architects, 20, Suffolk Street, Dublin. Proposed new theatre.

DUDLEY.—Alterations to works, Alma Place, for J. Buckley.

DUNDEE.—Baths; H. Thomson, architect, 87, Commercial Street, Dundee. Warehouse, for J. Prain & Sons, Brook Street; warehouse, in Bruce's Entry, for Dundee Coffee Houses Association; alterations for W. G. Andrews, Dock Street; alterations on property for H. and A. Scott, Ltd., Seafield Lane; alterations for T. Shaw, Dundee, Ltd., motor-car dealers, Ward Road.

DUNFERMLINE.—Three tenement blocks for R. McGregor, plasterer, Grantsbank Street; alterations on property at Balridgeburn, for A. S. Fearnie.

DURHAM.—Roman Catholic Schools, Ushaw Moor, for Rev. E. J. Beech. School, Chilton Buildings; C. Green, architect, Norfolk Street, Sunderland; A. J. Cooke, builder, Stockton.

EBBW VALE (Mon.).—New manse for Libanus Church. J. W. Horsfall, architect, Ebbw Vale.

ECCLES.—Four houses, Trafford Road, and eight in Chapman Street; Burton and Kerfoot. Twenty-four houses; Wooler & Sons.

EDINBURGH.—Proposed riding school at the Dean Bridge, for Jack and Renwick.

EGERTON (near Bolton).—Rebuilding portions of Egerton Mills, for J. & P. Coats, Ltd., Paisley.

EXMOUTH.—Six villas in Phillips's Avenue; T. Rowsell, builder, Exmouth. Y.M.C.A. building (£889); G. Beavis, architect, 4, Johnson's Place, Exmouth; A. Hayman, builder, Church Street, Exmouth. Probable re-erection, after fire, of Crossways (residence), for C. L. Weare Gardener.

FARINGTON (near Preston).—Additions to St. Paul's Church. J. A. Seward, architect, 148, Church Street, Preston.

FARNHAM.—Proposed church house, Union Road (£3,000).

FERRYHILL (Co. Durham).—Chapel. T. E. Davidson, architect, Pear Buildings, Newcastle-on-Tyne.

FIVEHEAD (Somerset).—Restoration of church. Rev. J. Rigby, vicar.

FIVEMILETOWN (Co. Tyrone).—New Methodist church.

FOLKESTONE.—Proposed new church at Cheriton, on site given by Lord Radnor.

GALWAY.—R.C. cathedral contemplated.

GATESHEAD.—St. George's parochial buildings. R. Wylie, architect, 36, West Street, Gateshead.

GIRVAN (Ayrshire).—Town hall. W. J. Jennings, architect, 4, St. Margaret' Street, Canterbury.

GLASGOW.—Alterations for R. W. Forsyth, Ltd., 1, Renfield Street. Roman Catholic Church in Old Dalmarnock Road, Bridgeton, for Archbishop Maguire (£10,800). Repairs at the Glasgow Royal Infirmary, after fire. Church at Dalmarnock (£15,000); C. Menart, 241, West Regent Street, Glasgow. Block of dwellings; J. Boswell, 57, Rothwell Street, Glasgow.

GLASS HOUGHTON (YORKS.).—Hotel, for Mr. Darley.

GORSEINON.—Twelve houses on Eynon Estate. C. S. Thomas, Meager and Jones, architects, Swansea.

GRAVESEND.—New paper mills for the Imperial Paper Mills, Ltd. (a new concern).

GULLANE (N.B.).—New Royal Hotel. Wm. Williamson, architect, Royal Bank Buildings, Kirkcaldy.

HALIFAX.—Church extension schemes in connection with St. Paul's, King Cross (£15,000), Rev. H. Bright, vicar.

HAMILTON (N.B.).—Proposed new academy; Burgh School Board.

HAMPSHIRE.—Secondary school, Aldershot; girls' school, Basingstoke; girls' school, Winchester (£8,475); class-room Awbridge School (£675); class-rooms, &c., Bullocks Heath School (£918); class-room, Milton Ashley School (£660); class-rooms, &c., Petersfield Boys' School (£1,001). H. Barber, clerk to Hampshire County Council, Winchester.

HANCHURCH (NORTH STAFFS.).—New cripples' home (£1,000); Duchess of Sutherland, Stafford House, London.

HANDFORTH (CHESHIRE).—New dye works; Dyers Association.

HANLEY.—Alterations to the Talbot Inn, Market Street; the licensee.

HARPENDEN.—Consumptive Sanatorium, for the National Children's Home and Orphanage; Rev. Dr. Gregory, principal, Harpenden.

HASLINGDEN.—Proposed extension at Hazel Mill. Additions to secondary technical school; J. S. Green, Council surveyor, Bury Road, Haslingden.

HESSLE (near HULL).—Additions to St. James's Mission Chapel; J. Bilston, architect, Hull.

HODDESDON.—New Council school at Rye Park; U. A. Smith, county surveyor, Hatfield.

HOLSWORTHY.—Rebuilding and enlargement of Bodmin Street Primitive Methodist Church,

HOLYWELL GREEN (near HALIFAX).—Mill, for R. & J. Holroyd, cotton spinners. Priestley Bros., builders, Stainland.

HUCKNALL TORKARD.—Four shops (£1,378). Harry Spencer, architect, Hucknall; J. Lewin, builder, Carlton, Notts.

HUDDERSFIELD.—School, Wigan Lane. Garside & Pennington, architects, 2A, Wesley Street, Castleford.

HULL.—Probable re-erection, after fire, of offices, for J. Good & Sons, shipping agents, High Street. Buildings in Anlaby Road, for Territorial Association; Wellstead & Dossor, architects, Hull.

HULTON.—Block of shops, for Co-operative Society. Henderson & Brown, architects, Two Folds Street, Bolton.

HYTHE.—Extension of premises, for the International Stores, High Street.

ILFRACOMBE.—Boarding house, St. James' Place, for R. H. Lewis; F. C. Horwood, architect, High Street, Ilfracombe.

INVERNESS.—Proposed new police buildings. Burgh Surveyor.

KEIGHLEY.—Probable re-building, after fire, of Oakworth House, near Keighley, residence of the late Sir I. Holden.

KETTERING.—New Sunday Schools, at rear of London Road Congregational Church (£3,000.)

KING'S LYNN.—Shop and premises, Purfleet Street. Scott & Sons, High Street.

KIRKHAM.—Renovation of Ribby Hall (after fire). W. Duckworth.

LANARK.—Villas for Dr. J. B. Moffat, Glenboig, and for J. R. Marshall, Bishopbriggs.

LEEDS.—Alterations and additions to the Maternity Hospital, 42, Hyde Terrace. S. D. Kitson, architect, Greek Street Chambers, Leeds.

LEVENHAM (BUCKS.).—School. C. Riley, county school surveyor, Old Church School, Aylesbury.

LINLITHGOW.—New Presbyterian Church, at Carriden (£5,500).

LITTLEHAMPTON.—Alterations to 20, High Street, for Mr. Cocksedge; two houses and shops in Western Road, for Linfield & Sons.

LITTLE HULTON (near BOLTON).—Proposed gasworks. J. T. Davies, surveyor, Council Offices, Little Hulton.

LIVERPOOL.—Mansfield Street Public Baths extension. Engineer, Corporation Offices, Liverpool.

LONDON (HAGGERSTON, N.E.).—Conversion of police station, Kingsland Road, into business premises. Lovegrove & Papworth, architects, Town Hall Chambers, Old Street, E.C.

(EAST HAM, E.).—Mortuary on site adjoining Town Hall. A. H. Campbell, borough engineer, East Ham.

(WEST HAM, E.).—Twelve houses, Chester Road. M. A. Haines, builder, 24, Plashet Road, E.

(ISLINGTON, N.).—Extension of stabling at Liverpool Road depôt (£1,350); J. P. Barber, borough surveyor, Town Hall, Upper Street, N. Buildings on site of 236 and 238, Pentonville Road; H. C. Braun.

(GREAT QUEEN STREET, W.C.).—Extension of the Freemasons' Tavern premises to Middle Yard.

(E.C.).—Alterations at 2, Queen Victoria Street, and 18-21, Poultry.

(HACKNEY WICK, N.E.).—Buildings, Berkshire Road, for E. Austin and Sons, Barrett's Grove, Stoke Newington.

(WANDSWORTH, S.W.).—Six houses, Wimbledon Park Road, and seven in Seymours Road, Southfields. W. Wright, builder, 124, Asylum Road, Old Kent Road, S.E.

(CANNING TOWN, E.).—Factory, Wharf Street. M. Zimmermann, architect, 8, Henrietta Street, E.C.

(STRATFORD, E.).—Grinding room, Wharton Road, for Jenson and Nicholson.

(WESTMINSTER, S.W.).—Extension of premises of North British and Mercantile Insurance Co., Waterloo Place, S.W. Disinfecting station, residences for employés, and offices, Grosvenor Canal. John Murray, architect, 11, Suffolk Street, Westminster, S.W.

(HITHER GREEN, S.E.).—Drill hall and riding school for the 10th and 11th Batteries, 4th London Royal Field (Howitzer) Artillery.

(TOOTING, S.W.).—Lighting installation at the King's Hall, High Street. Emden, Egan & Co., architects, 2, Lancaster Place, Strand, W.C.

(ST. PANCRAS, N.W.).—Secondary school and training college at Grove Farm for L.C.C. T. J. Bailey, L.C.C. architect, Education Offices, Victoria Embankment.

(PADDINGTON, W.).—Proposed buildings in Biddulph Road and Ashworth Road for the General Motor Cab Co. C. W. Stephens, architect, 49, Hans Road, Brompton Road, S.W.

(WOOLWICH, S.E.).—First portion (£11,000) of Abbey Wood car-shed for L.C.C. W. E. Riley, chief architect, County Hall, Spring Gardens, S.W.

(HOLLOWAY, N.).—Painting shop at Holloway L.C.C. car-shed. A. L. C. Fell, tramway manager, 61, Finsbury Pavement, E.C.

(HAMPSTEAD, N.W.).—Alterations at the Hampstead Conservatoire, Eton Avenue; E. N. Gallich, secretary, 64, Eton Avenue, N.W. Buildings in Hampstead Road, for J. Rossdale, 7, Pembridge Villas, Bayswater, W.

LONDON (FINSBURY PARK, N.).—Conversion of disused tramway depot into business premises. C. Lapthorne.

(NORTH FINCHLEY, N.).—Alterations, 71, High Street (£2,048). V. Vagnolini, architect, 33, Stirling Road, Clapham Rise, S.W.; A. Fairhead & Son, builders, Sydney Road, Enfield.

(W.C.).—Alterations at the Hicks Theatre, Shaftesbury Avenue. O. Barrett.

LONG EATON.—Increased school accommodation. Clerk, Long Eaton Education Committee.

LOUGHOR.—Rebuilding church, vestry and new organ chamber, &c. Thos. Arnold, the Park, Llanelly.

LONGWOOD (near HUDDERSFIELD).—Ten houses. Lunn & Kaye, architects, Milnsbridge.

LOWESTOFT.—Sawmills, Commercial Road, for Saul & Sons, Commercial Road.

LUTON.—New school at Beech Hill, Dunstable Road. J. R. Brown & Sons, architects, Castle Street, Luton.

LYTHAM.—Five shops at Angdell. Surveyor, Council Offices, Lytham.

MANCHESTER.—New buildings and factories in Trafford Park; Trafford Park Estates, Ltd., Manchester. Prospective rebuilding, after fire, of large lodging house in Grosvenor Street.

(WEST GORTON).—Rectory, for St. Mark's Parish. R. Basnett Preston, architect, Manchester.

MARGATE.—Conversion of Royal York Hotel into flats, shops, &c., for Mr. Vandenberg. Reeve & Reeve, architects, Margate.

MAUD (ABERDEENSHIRE).—New U.F. Church. Clerk, Deacons' Court, U.F. Church, Maud.

MELDRETH (near ROYSTON, HERTS.).—County schools (£2,284). Gimson and Co., builders, Royston.

MERTHYR TYDFIL.—New premises, for the Y.M.C.A. (£4,000). I. Jones and P. Thomas, architects, Mary Street, Cardiff.

METHERINGHAM (near LINCOLN).—New Sunday schools. Messrs. Horton, builders, Lincoln.

METHIL (FIFE).—Four villas, for A. McDonald, builder, Bay View, Methil.

MIDDLESBROUGH.—Secondary school. A. Forrester, architect, 20, Albert Road, Middlesbrough.

MITCHAM.—Probable rebuilding, after fire, of artificial horse-hair manufactory, Sutton Road.

NELSON (LANCS.).—Rebuilding General Gordon Inn.

NEWBIGGIN (NORTHUMBERLAND).—Alterations and additions to police station, for the C.C. J. A. Bean, county architect, The Moot Hall, Newcastle-on-Tyne.

NEWBURY.—New municipal offices.

NEWCASTLE-ON-TYNE.—Proposed hotel, Pink Lane; Jas. Smart, Newcastle-on-Tyne. Dunstan Excelsior Club premises (£3,960); White and Stephenson, architects, 59, Grey Street, Newcastle-on-Tyne; T. Clements, builder. School at Forest Hall; M. Forrest, architect, Moot Hall, Newcastle-on-Tyne. New Primitive Methodist schools, Chilton Lane Ends; J. W. F. Phillipson, architect, 8, Grainger Street, Newcastle.

NEWPORT (MON.).—Proposed new school at Usk, for the Monmouthshire Education Committee.

NORTHENDEN (LANCS.).—New Council school. Mangnall & Littlewood, architects, 42, Spring Gardens Manchester.

NORTHFLEET.—Conversion of premises into houses, for J. B. Lingham, builder, 1, The Hill.

OSWALDTWISTLE.—Fire station (£1,300); R. Hunter, borough surveyor, Oswaldtwistle. Proposed new Primitive Methodist Sunday School.

PAISLEY.—Salvation Army Hall (£5,000). Secretary, Salvation Army, Paisley.

PARK PREWETT (HANTS.).—New Asylum for Hants County Council. George T. Hine, architect, 35, Parliament Street, Westminster, S.W.

PINNER.—Billiard and club room at the George Inn, for J. Lardner.

PLYMOUTH.—Extension of boiler-house at brewery for Octagon Brewery Co., Ltd., Martin Street, Plymouth. Extension of Devon and Cornwall Homœopathic Hospital; F. A. Wiblin, architect, 92, Old Town Street, Plymouth. Twelve houses; Mr. Mussell, builder, Derry Street. New St. Gabriel's Church, Hyde Park Road. Re-building business premises, after fire, for Mrs. F. Marshall, 33, Russell Street.

PONTARDAWE.—Extension of Alltwen Congregational Chapel and new organ chamber. W. B. Rees, architect, Dumfries Place, Cardiff.

PONTYPOOL.—Additions to Pontypool Hospital; S. Williams, architect, Wharton Street, Cardiff. Alterations to Crane Street Baptist Chapel; D. J. Lougher, architect, Pontypool.

PORTSEA.—Extensions to Jewish Synagogue. F. J. Privett, builder, Cottage Grove, Southsea.

PORTSMOUTH and SOUTHSEA.—Proposed new almshouses.

PORT TALBOT.—Extensive dock developments (£55,000).

PRESTOLEE (BOLTON).—School (£6,000). H. Littler, architect, Ribblesdale Place, Preston.

RADCLIFFE.—Ten houses, Dumers Lane. Write, 154, Cross Lane, Radcliffe.

RAVENSTHORPE (YORKS.).—Additions to the Victoria Laundry for L. Hinchcliffe & Son; houses and shop, North Road, for J. Senior.

RAWMARSH.—Isolation hospital, laundry, &c., for the U.D.C. J. Platts, architect, High Street, Rotherham.

READING.—Co-operative bakery (£12,699). Collier & Catley, builders, St. Mary's Butts, Reading.

REDCAR.—Additions, Zetland school. North Riding Education architect, Northallerton.

ROTHERHAM.—Twenty-eight houses, Cavendish Road, Selbourne Street and Lindley Street, for Chas. Green's Sons; proposed additional office accommodation for T.C.; G. Jennings, borough surveyor, Rotherham.

RUTHERGLEN.—Additions to paper mills, Cambuslang Road, for Clyde Paper Co.

ST. ANNE'S-ON-SEA (LANCS.).—Villas, Kensington Road, for G. F. Bunce; Kensington Road, for Wm. Crawshaw. Addition to Technical School; H. Gregory, architect, St. Anne's-on-Sea.

ST. ASAPH.—Proposed Isolation Hospital. Surveyor, Council Offices, St. Asaph.

ST. IVES (HUNTS.).—Proposed Free Church Manse; Mr. Craig, architect, Houghton (Hunts.)

SALTBURN.—Conversion of convalescent home into offices for a Friendly Society.

SHEFFIELD.—Rebuilding Hotel Leopold, Leopold Street; Sheffield Hotels, Ltd. Extensions to the Royal Infirmary; Gibbs & Flockton, architects, 15, St. James Row, Sheffield.

SHIELDHALL (GLASGOW).—Buildings at Outfall Works; Mr. McDonald, City engineer, Glasgow.

SHIPLEY.—Alterations to business premises, 31, Briggate, for A. E. Kirk and Co., drapers.

SHOTTON COLLIERY.—School; W. Rushworth, Shire Hall, Durham.

SLAITHWAITE (YORKS.).—New premises for the Halifax Joint Stock Banking Co.; J. Berry, architect, 3, Market Place, Huddersfield.

SLEAFORD.—E.L. installation at the Wesleyan Church.

SOUTHAMPTON.—Conversion of shop spaces into tenements for the T.C. Borough engineer.

SOUTH SHIELDS.—Shop extension. 16, Cuthbert Street, for Thos. Guthrie. G. R. Smith, architect, 67, King Street, South Shields.

SOWERBY BRIDGE.—Extensions to Victoria Works, for Siddal & Hilton.

STILLORGAN (Dublin).—Convent, recently destroyed by fire, to be rebuilt (£20,000). W. H. Byrne & Son, architects, 28, Suffolk Street, Dublin.

SUDBURY (Suffolk).—Roman Catholic Schools (£1,000). W. Hull, architect, St. Giles' Street, Northampton.

SUNNINGHILL (Berks).—Extensive additions to the Parish Institute; F. Pizzey, builder, Sunninghill. Additions to Earleywood School; W. Watson, builder, Ascot.

SUTTON (Surrey).—Six villas, The Crescent, Westmead Road, for G. Hitchings; thirty-two houses, Pelton Avenue, for J. J. Tully.

SWANSEA.—New tin-plate works near the new dock, for Baldwin, Ltd.

SWINDON.—New Primitive Methodist Church. Pumping plant driven by electric motors at the Sewage Works, for the T.C.

TAUNTON.—Reconstruction of Mr. Bryant's wine and spirit vaults, Fore Street; E. Emery, surveyor, Oakhill Brewery, near Bath. Rebuilding old English residence, Fore Street; F. W. Gibbs, builder, Taunton. Detached residence for Headmaster of Taunton School; F. W. Roberts, architect, 2, Hammet Street, Taunton.

TIPTON.—Sewage disposal scheme, for the U.D.C. (£16,929). Mr. Firth, contractor, Harrogate.

TODDINGTON (Beds.).—School. Clerk to Bedfordshire County Council.

TODMORDEN.—New secondary school on the Stile Estate (to be electrically lighted). J. Horsfall, architect, 4, Chapel Walks, Manchester.

TONBRIDGE.—Villa residences on The Drive, for W. Groombridge, builder, 6, Waterloo Road; and Geo. Welldon. School Sanatorium, off Shipbourne Road, for the Skinners' Co.

TREDEGAR.—Chapel in Arthur Street. W. S. Williams, architect, Tredegar.

TRING.—Electrical installation at the Parish Church (cost of complete installation £381, exclusive of engine-house). Rev. A. Francis, vicar.

TUNBRIDGE WELLS.—Garage and petrol store, Mount Ephraim Hotel, for F. M. Hayden.

TYLDESLEY.—New farm buildings, Chaddock Road, for Lord Ellesmere; extensions to premises, Co-operative Society.

WAKEFIELD.—Music hall for Mrs. F. Sherwood; F. Matcham & Co., architects, 9, Warwick Court, Holborn, London, E.C. Rebuilding the Dolphin Inn, for Beverley Bros., brewers; Simpson & Firth, architects.

WALKDEN.—Nine houses, St. Mary's Park. Jas. Ridge, builder, Walkden.

WALLSEND.—Two public amusement halls; J. McHarg, architect and builder, Park Road, Wallsend. Additions to Fever Hospital; J. F. Davidson, architect, Wellington Quay.

WALSALL.—Oil store, Meadow Road, Anglo-American Oil Co., Ltd., 22, Billiter Street, London, E.C. Temporary machine house and sheds, The Midland Cement Co., Birchills Furnaces, Green Lane, Walsall.

WALTON-ON-THE-NAZE.—Public conveniencies. H. W. Gladwell, surveyor, Town Hall Buildings, Walton-on-the-Naze.

WARRINGTON.—Rebuilding of Lower Seven Stars Inn, for Greenall, Whitley and Co., brewers, also proposed new licensed premises, corner of Gorsey Lane and Norris Street, for the same firm.

WASHINGTON.—School (£6,000). F. Rennoldson, architect, 37, King Street, South Shields.

WEST BOWLING (Bradford).—Church school extension scheme contemplated at St. Stephens. Rev. W. F. Forster, vicar.

WEST WHORLTON.—Additions to school. M. Forrest, architect, Moot Hall Newcastle-on-Tyne; J. C. Mather, builder, Saltwell View, Gateshead.

WHITBY.—Extensive alterations to business premises, 4, Bridge Street, for Mr. Tyler, boot and shoe dealer.

WHITEHAVEN.—Twenty semi-detached villas, New Road. A. & T. H. Anderson, builders, New Road, Whitehaven.

WHITTINGHAM (Lancs.).—Asylum extension (£90,000). Sykes & Evans, architects, Chapel Walks, Manchester.

WIDNES.—Garage, repair shop, offices, stores and car-shed, for the T.C. J. S. Sinclair, borough surveyor.

WILLINGTON.—Wing at Council schools. F. E. Coates, Durham.

WINCHESTER.—Restoration, after fire, of Kingsgate College House. Additional offices for Hampshire County Council, St. James' Stree (£20,000); H. Barber, clerk to the County Council, Winchester.

WOKINGHAM.—Alterations and additions to The Beeches, Reading Road.

WOLVERHAMPTON.—Cleveland Arms (licensed house), Moseley Village, to be rebuilt.

WORCESTER.—Additions to grammar school. A. H. Parker, architect, The Cross, Worcester.

WORKSOP.—School (400 places). L. Maggs, architect, Shire Hall, Nottingham.

WREXHAM.—Shelters, lavatories, &c., Recreation Ground, for the T.C. J. B. Woolley, builder, Beechley Road, Wrexham.

WYTHEMOOR (Cumberland).—Coal-mining developments. Wythemoor Coal Co.

YARMOUTH.—Alterations to business premises, 168, King Street, for F. Hill.

YNYSYBWL.—Additions to Mixed School. W. H. Williams, architect, Town Hall, Mountain Ash.

The 5-Cent Universal Fare.—It has been for long the boast of the American that nowhere on the earth except in the States can so much travel-value be got for 2½d., and every visitor willingly endorses the claim. The 5 cent. fare for any distance on street cars has become such a tradition that it will be as hard to shake off as the Old Man of the Sea, and Mr. C. G. Goodrich gave expression to this opinion in the course of his presidential address to the American Street Railway Association. Using his own system as an illustration, he said that the Twin City lines serve 53 sq. miles in Minneapolis and 55 sq. miles in St. Paul, with the one fare standard in use. A large percentage of passengers is carried at cost, and some at an actual loss, and it is a question of time when the company "will have to determine how far a passenger can be carried for a single 5-cent fare. Already in some of the large eastern cities this question is beginning to receive most careful consideration." In Massachusetts, for instance, the tramway company is being allowed to increase the fare to 6 cents on one of the sections for a year as an experiment, while in New York, Philadelphia and Brooklyn agitation in the same direction is ripening to a crisis. We know already in London how fatal is the adoption of a starvation fare tariff to the interests of every form of passenger transit, and we think it quite wonderful that the vast street tramway systems of the States have been able to avoid universal bankruptcy under the burden of the 5-cent fare and a preposterously generous system of transfers.

FORTHCOMING EVENTS.

Physical Society.—Friday, February 12th. At 8 p.m. At the Royal College of Science, South Kensington, S.W. Annual general meeting. Presidential address.

Royal Institution.—Friday, February 12th. At 9 p.m. Discourse on "The Electrical Properties of Flame," by Prof. H. A. Wilson.
Friday, February 19th.—At 9 p.m. Discourse on "Recent Advances in Means of Saving Life in Coal Mines" by Sir H. Cunynghame.

Junior Institution of Engineers.—Friday, February 12th. At 7.30 p.m. At the Royal United Service Institution, Whitehall. Meeting with the Architectural Association Debating Society. Paper on "Heat Transmission in Buildings," by Mr. K. Gray.
Saturday, February 20th.—At 3 p.m. Visit to J. & E. Hall's Refrigerating Machinery and Automobile Works at Dartford.

Northampton Institute Engineering Society.—Friday, February 12th. Paper on "A Modern Winding Engine," by Mr. E. A. Smart.

Signal Engineering Society.—Saturday, February 13th. At 7.30 p.m. At the Mansion House Station Restaurant, E.C. Paper on "The Board of Trade Requirements for Railways," by Mr. H. Raynar Wilson.

Association of Engineers-in-Charge.—Saturday, February 13th. At St. Bride's Institute, E.C. Discussion on Mr. J. B. C. Kershaw's paper on "Feed Water and its Impurities."
Friday, February 19th.—At 7.30 p.m. Visit to the Battersea Polytechnic.
Saturday, February 20th.—At 7 p.m. At the St. Bride's Institute. Social. Dance.

Royal Society of Arts.—Monday, February 15th. At 8 o'clock. First of four Cantor Lectures by Mr. L. Gaster on "Modern Methods of Artificial Illumination. (I.—Electric Lighting.)

Institution of Electrical Engineers (Manchester Section).—Tuesday, February 16th. At 7.30 p.m. At the University, Manchester. Paper on "The Use of Large Gas Engines for Generating Power," by Messrs. L. Andrews and R. Porter.

Institution of Civil Engineers.—Tuesday, February 16th. At 8 p.m. Paper on "The Design of Marine Steam Turbines," by Mr. S. G. Reed.
Friday, February 19th.—At 8 p.m. Lecture on "Standardisation in Engineering Practice," by Dr. W. C. Unwin.

Royal Naval War College, Portsmouth.—February 17th and 18th. Lectures on "Submarine Telegraphy in its Relation to the Navy and Warfare," by Mr. C. Bright, F.R.S.E.

Institution of Mechanical Engineers.—Friday, February 19th. At 8 p.m. Annual general meeting.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, February 15th.—"A" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Tuesday, February 16th.—"B" Company. Infantry drill (recruits), 7 to 7.45 p.m. Technical drill, 7 to 9.30 p.m.

Thursday, February 18th.—"C" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Friday, February 19th.—"D" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7.15 to 9.30 p.m.

Saturday, February 20th.—"C" Company. Week-end run at Coalhouse Fort. Parade at Fenchurch Street station 3.10 p.m.; service dress with greatcoat and arms. Toilet requisites to be carried in haversack.

Recruiting every evening 6 to 9 p.m. (Sundays excepted).

(Signed) J. H. S. Phillips,
Capt. and Acting Adjutant.

The Electrical Engineers (London division), whose headquarters are at Regency Street, Westminster, and whose duty in war time is to work coast-defence searchlights, have vacancies for smart intelligent young men who are engaged in electrical or mechanical engineering or allied trades. The annual conditions of efficiency are almost the easiest in the service, viz, 18 drills for recruits and six drills for trained men, together with 8—15 days at camp. The work itself is extremely attractive, including the practical handling of oil and steam engines, dynamos, automatic searchlights, and instruction in signalling, telephony, and various military engineering subjects. Visitors are welcomed at headquarters.

INQUIRY COLUMN.

[Replies under cover to us should be accompanied by stamped envelopes ready for retransmission to our correspondents.]

Correspondents ask for the names of manufacturers or suppliers of the following items:—

Time-Limit Maximum-Current Cut-Outs, in suitable form for installing inside arc lamp cases.

An Electric Magic Lantern for automatic advertising.

"Voss Electric Flashers" and "Kama Electric Projecting Lamps."

"Arcazon" Arc Lamp.

Portable apparatus for Testing Circuit-Breakers in position on tramcars.

NOTES.

Bremer Arc Lamp Patent Revoked.—The Comptroller of Patents (Mr. C. N. Dalton) has issued his decision in the matter of an application presented by Mr. George Braulik concerning Patent No. 18,786 of 1902, of which the British Westinghouse Electric and Manufacturing Co., Ltd., are proprietors, and which relates to "electric arc lamps of the class in which the electrodes are inclined to each other and both point in the downward direction, the arc being formed at the lower extremities." The Comptroller concludes his finding in the following terms:—

"On the evidence before me, I have come to the conclusion that the patented article has not been manufactured to an adequate extent in the United Kingdom, and that the reasons given by the patentees why it has not been so manufactured are very far from satisfactory. I therefore decide, subject to an appeal to the Court, to revoke the patent forthwith, and I order the patentees to pay to the applicant the sum of 75 guineas in respect of his costs."

The "Cardiff" Contract Advertisement.—We observe in a contemporary a reference to the advertisement recently published in the ELECTRICAL REVIEW for tenders for electrical work at Cardiff for the "Boston Collapsible Barrel and Manufacturing Co." The writer states that as many as 105 firms have been traced who sent in £5 Bank of England notes, but this is not correct, the actual number of letters received not being anything like that. Owing to the prompt action taken by us we have reason to believe that the amount lost is less than £20. Our contemporary also says that the address given in the advertisement (79, York Road, Lambeth) is an empty house. This is not the case. Really it would be interesting to know the source of our contemporary's information. We believe we are right in saying that in nearly every instance the letters that were delivered at the above address have been, or are in process of being, returned either by the postal authorities or in some other way.

London Electric Supply.—Last Tuesday's *London Gazette* contains notice of an application to be made to Parliament by the Board of Trade in the 1909 Session:—

To constitute or make provision for constituting the London County Council the purchasing authority within the administrative County of London of the undertakings of the electric lighting companies mentioned below in lieu of, and in substitution for, the local authorities as defined by the Electric Lighting Acts, 1882 and 1888, or any other local authority by whom any such undertaking or any part thereof, may be purchaseable, either under those Acts or under the Acts and Orders regulating the several companies mentioned in the second column of the Table, and for that purpose to extend and make applicable to, or to re-enact with respect to the said companies or any of them, all or any of the provisions of Secs. 23 to 27, both inclusive, of the London Electric Supply Act, 1908, either without modification, or with such modification as may be contained in the said intended Act.

Names of distributors.	Titles of Acts or Orders.
Kensington and Knightsbridge Electric Lighting Co., Ltd.	Kensington and Knightsbridge E.L. Order, 1889. South Kensington E.L. Order, 1889. Kensington and Knightsbridge and Chelsea E.L. Act, 1892. Kensington and Notting Hill E.L. Companies' Act, 1899.
Notting Hill Electric Lighting Co., Ltd.	Notting Hill E.L. Order, 1889. Notting Hill E.L. Order, 1895. Kensington and Notting Hill E.L. Companies' Act, 1899. Notting Hill E.L. Act, 1901.
St. James' and Pall Mall Electric Light Co., Ltd.	St. James' E.L. Order, 1890. St. James' and Pall Mall E.L. Co.'s Act, 1899.
Westminster Electric Supply Corporation, Ltd.	Westminster E.L. Order, 1889. Westminster E.L. Order, 1891.
Central Electric Supply Co., Ltd.	Central Electric Supply Co.'s Act, 1899. Central Electric Supply Co.'s Act, 1905.

Gun Sights.—The new low voltage metal-filament lamp has not yet been applied to night sights for guns in the Navy. It would appear that there is a considerable field of utility for them in this direction. There is an advantage in each gun having its own battery and light, but hitherto the large consumption of current taken from the batteries during night firing by the tiny carbon lamp has been a great source of trouble. What is wanted is a small light of insignificant power, but consuming such a small current as to render it efficient during long periods with battery supply.

Foreign Patents.—A movement is on foot with the object of forming an organisation in London for the purpose of enforcing the provisions of the Patents Act, in order to secure the revocation of foreign patents not adequately worked in this country.

Tramcar Driver Charged with Manslaughter.—At the North London Police Court last week, A. W. Hughes, aged 24, a driver employed by the Metropolitan Electric Tramways, Ltd., was committed to the Central Criminal Court on bail, on a charge of manslaughter. According to the *Times* report, evidence was given by a Scotland Yard inspector that there was a defect in the controller caused by some foreign substance which could easily have been removed by a person who knew how to do it. There were no defects in the car, and he could see no reason for driving the car from the rear. If the driver thought himself incompetent to remedy the defect, he should have left the car until assistance arrived.

Portsmouth Dockyard Electrical Engineers.—FIRST ANNUAL DINNER.—The members of the Electrical Engineers' Department at H.M. Dockyard, Portsmouth, held their first annual dinner at the Fratton Hotel last Saturday week. Mr. G. Littlefield, the president of the Electrical Engineers' Local Association, presided over a company of about 70. Mr. F. G. Tyler submitted the toast of "The Officers of the Electrical Engineers' Department." The electrical engineers' position was a much envied one in the Yard at present, due to the fact that the building of the *Dreadnought* was responsible for the permanent formation of the electrical department. Year by year, moreover, the work was increasing, and soon they would become one of the most important departments in the Yard. Mr. J. Ward, on behalf of the officers, thanked the assembly. He was proud to see such a fine Association as they had, and he thought the officers might be asked to become honorary members. Twenty years ago, Mr. Ward continued, electrical engineers were known as "wire-pullers," and went from ship to ship as the work was completed. That method nowadays was quite impossible, owing to the growth of the work.

Prize Competition.—According to *L'Industrie Electrique*, the Société Industrielle d'Amiens has instituted a competition for medals or money prizes, for the solutions of several problems, including the invention of an electric generator of the highest efficiency, a storage battery, an incandescent lamp, and a fusible cut-out. Competitors must send in their attempts by July 1st, 1909, to the president of the Society, Rue de Noyons, 29, Amiens.

Tramway Whist Drive.—A successful whist drive, promoted by the employés of the Lancashire United Tramways Co., took place recently in the large car-shed in Partington Lane, Swinton. Close upon 100 players took part.

Charge of Embezzlement.—It is reported that Frederick Kerswell, collector in Hastings Corporation electric light department, was recently charged with embezzlement and falsifying the Corporation books. It was stated that a considerable sum was involved.

Radium Institute.—It is announced that the King is about to grant a Royal Charter establishing a Royal British Radium Institute, for the purposes of carrying out research regarding the curative properties of radium, and of treating cases of disease. The Council of the Institute will include Sir Frederick Treves, Sir Wm. Ramsay, Prof. Sir J. J. Thomson, and the Hon. R. J. Strutt. The funds have been provided by Sir Ernest Cassel.

Football.—The members of the Roger Dawson Football Club held their dinner at the Holborn Restaurant on Saturday evening last, when there was a large attendance of members and friends. Mr. Duncan Watson, M.I.E.E., occupied the chair, supported by Mr. J. H. Rosoman. The toast of "The Club," briefly proposed by the chairman, was responded to by Mr. F. S. Prentice. Mr. J. A. Woods proposed the toast of "The Visitors." Mr. C. Poland responded. A musical programme followed.

ELECTRICAL FOOTBALL LEAGUE.—The following matches take place next Saturday, the kick-off being at 3 o'clock in each case:—St. Pancras Electric *v.* Ediswan, at Swain's Lane, Highgate; County of London Electric *v.* St. James' Electric, at the Guards' Polo Ground, Southfields.

The first annual smoking concert of the L.C.C. Sub-station Football Club was held at the Athenæum on Friday last, 5th inst., with Mr. Pope, A.M.I.E.E., distributing engineer, in the chair. In proposing the toast of the club, the chairman remarked upon the club's success, it having played 10 matches, drawn two, and lost only one. Mr. A. S. Howarth, the captain, suitably responded; and a very happy evening, at which about 50 were present, was concluded. The arrangements were in the hands of Messrs. Peterson and Bell. The entrance fee for this club is 2s. 6d., and all L.C.C. sub station men are eligible for membership

An Overcrowded Profession—Where to find Employment.—The engineer inmate of the Slough Workhouse, in an application for "preferential" treatment in the house on account of the services he rendered as engineer, reminded the Board of Guardians that in some institutions the "man in charge of work similar to his was allowed five shillings per week and officers' diet, which meant a great saving in place of employing an engineer at £2 per week." The Board agreed that the "engineer inmate" should have extra rations, as no fault was to be found with the way the man did his work.

New Accumulator.—The *Daily Mail* reports that a new storage cell called the "Tolhurst," has been invented by an Italian named De Martis; it is lighter than existing types, and can be charged and discharged very rapidly without injury. It is stated that the plates are placed horizontally, and are separated from one another by "thin cellulose sacking."

Annual Dinner of the Lancashire Electric Power Co.—The annual dinner held by the Lancashire Electric Power Co., at which the staff and customers were entertained, was held at the Corn Exchange Hotel, Manchester, last Saturday week. The company numbered about 60, and included Mr. C. D. Taite, engineer and manager, who presided. Representatives from a number of power-using industrial firms and local authorities were present. After dinner a smoking concert was held. Mr. Hodgson proposed "The Lancashire Electric Power Co.," Sir Robert Hampson responding. "Our Guests" was submitted by Mr. Taite, and acknowledged by Mr. Rushden and Mr. Hayward.

(*Continued on page* 265.)

ELECTRICITY SUPPLY IN BRISTOL, 1909.

It is not our intention to deal with the historical features of electricity supply in Bristol, otherwise than to mention that it dates from August, 1893, when the original Temple Back generating station was first put to work. Subsequently, with expanding business, a more modern power station—the Avonbank station—was constructed, on a site which, while offering every facility for future extension, is within easy distance of all parts of the city. The first section of the Avonbank works was completed in December, 1901, and a description of the plant then installed appeared in the Electrical Review of March 21st, 1902.

At that time the distribution arrangements comprised a 2,000-volt single-phase alternating system, with static sub-stations for supplying at 105 and 210 volts; a direct-current three-wire system, with pressures of 250 and 500 volts; also a 600-volt direct-current supply for arc lighting. The latter system has, however, since been displaced by 500-volt direct-current flame arc lighting.

But a much more important development has taken place since our last article appeared, viz., the installation of a 6,000-volt three-phase system with rotary and static sub-stations in the city, and as far afield as Avonmouth (some 8¼ miles distant), where the new dock estate of the Corporation is being supplied.

The foregoing remarks serve to indicate the varied character of the Bristol electric supply, which is fed, as far as is practicable, solely from the modern Avonbank plant, the Temple Back works being used largely as a sub-station.

A reference to our original article on the Avonbank installation will show that at that time, two Siemens fly-wheel type single-phase alternators coupled to Willans central-valve engines, and each giving 745 kw. output, were installed, also two smaller Willans-Siemens direct-current 500-volt sets.

Since then eight turbo-alternators have been added, the station having been lengthened proportionately; the particulars of this plant, which is shown in figs. 1 and 6, are as follows :—

No.	Type.	Speed, R.P.M.	Normal rating, kw.	Overload rating, kw.
2	Parsons, rotating armature; one-phase, 93 cycles 2,300 volts.	1,860	750	950
1	Parsons, rotating field; one-phase, 93 cycles, 2,300 volts; with direct coupled two-pole exciter.	1,860	750	1,000
1	Parsons-Siemens, rotating field; one-phase, 93 cycles, 2,300 volts; with direct-coupled exciter.	2,790	600	—
2	Willans-Dick, Kerr, rotating field; three-phase, 50 cycles, 6,000-6,600 volts; with direct-coupled exciters.	1,500	1,000	1,250
1	Westinghouse, rotating field; one-phase, 93 cycles, 2,300 volts.	1,500	3,000	3,750
1	Westinghouse, rotating field; three-phase, 50 cycles, 6,000-6,600 volts.	1,500	3,000	3,750

Fig. 1.—Interior of the Engine Room, Avonbank Generating Station, showing the Switch Gallery, &c.

It will be noticed that certain of the above machines have their own exciters, and independent 100-volt Willans-Westinghouse and Willans-Siemens exciting plant is provided for general use.

The various turbines are arranged, as is usual, directly over their condensing plants, which are installed in a basement running up the centre of the engine house. Ten surface-condensing plant in all are provided, including installations by Allen, Alley & McLellan, Parsons, and Mirrlees Watson; these have, for the most part, Edwards

three-throw air-pumps, and some of them are also provided with independent circulating pumps.

In an open basement (seen in fig. 1), a central circulating plant is provided for general use, comprising two steam-driven and two motor-driven centrifugal pumps, with a combined capacity of some 14,000 gal. per min.

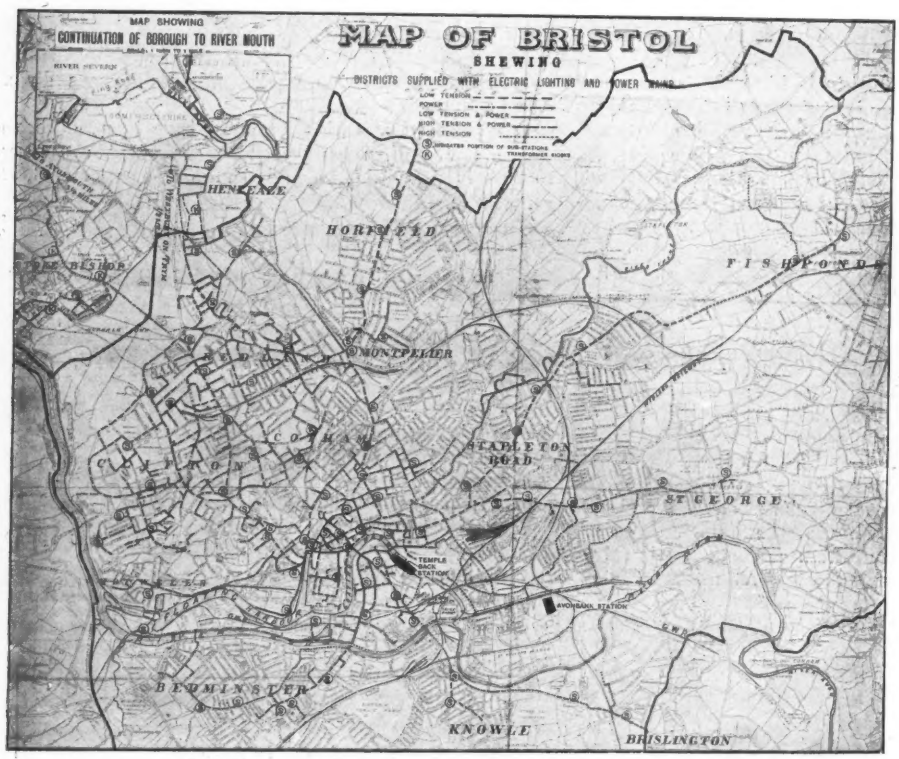


Fig. 2.—The Bristol Electricity Supply Network.

This basement contains also two Weir and two Hall general service pumps, each of 10,000 gal. per hour capacity. All the pumps draw from a well in the basement, which is fed from the "Feeder"—an adjacent canalised section of the Avon, to which also the water is returned. The whole of the power motors in the station are of the 500-volt. D.C. type, fed from the 500-volt D.C. generating plant in the station, which now comprises some 840 KW., in three steam-driven sets, and a 300-KW. Peebles motor-converter, the latter operated from the 6,600-volt three-phase supply.

For erection and repair work a 15-ton and a 30-ton electrical crane are provided in the engine house.

Turning to the boiler-house plant, there are now installed 16 Babcock & Wilcox boilers, the last four put down being of the marine type (fig. 3).

The normal steam-raising capacity of the plant is approximately 300,000 lb. per hour; the marine boilers contributing 100,000 lb. of this total. Meldrum Koker stokers and standard internal superheaters are fitted to all boilers, also one economiser is provided to each pair of boilers. The whole of the gases pass up two short steel stacks, at the bases of which induced draught plant is installed.

The original induced draught plant comprised four Bumsted & Chandler fans, three of them steam-driven, and later additions include three 70-in. Musgrave fans, coupled to 110-H.P. Peebles motors.

Fig. 3.—The Boiler House, Avonbank, with New Babcock Marine Boilers on the Left.

Fig. 4.—Cellular Work for New Siemens E.H.T. Three-phase Switchgear.

The steam is supplied at 200 lb. pressure, and superheated some 200° F.

Five 8,000-gal. per hour feed pumps, by Weir, Hall, and Clarke-Chapman, supply the water requirements of the steam raising plant, working in conjunction with a Doulton water-softener, and drawing from storage tanks, one of which, recently brought into use, is a circular ferro-concrete tank, 55 ft. 6 in. in diameter and 11 ft. deep, with a capacity of 150,000 gal.—this, needless to say, being outside.

The switch gallery, seen on the right of fig. 6, contains a necessarily extensive array of switchgear for controlling the output of the station. This switchgear has been extended from time to time, and varies in design according to the period at which it was installed. A feature of particular interest is the new three-phase 6,600-volt switchgear, which Messrs. Siemens are erecting at the farther end of the building; the new cellular work for this latest gear is shown in fig. 4.

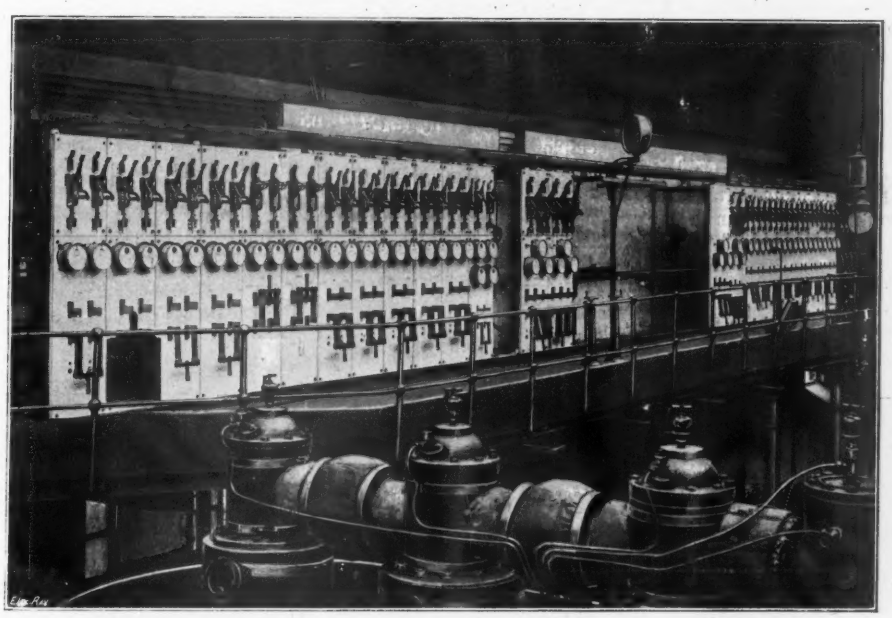


Fig. 5.—New Siemens Direct-Current Board at the Temple Back Works.

It will next be convenient to refer to the distributing network, some idea of which can be gathered from the plan, fig. 2.

With minor exceptions, the whole of the lighting is supplied from the single-phase network, and the bulk of the power load is carried on direct-current circuits, the exceptions to the latter being a few three-phase and numerous single-phase motors.

The extra-high-tension trunk feeders are of the Siemens three-core, paper-insulated, lead-covered and sheathed type, laid solid in troughing. The Avonmouth, Temple Back and Underfall yard sub-stations are each supplied by three trunk-feeders (three ·1 sq. in., three ·15 sq. in., and three ·05 sq. in. respectively); there are also two static sub-stations, with an ultimate capacity of 500 kw., in use for supplying portions of St. George and Hotwells, and four in course of construction, these being fed from Avonbank by nine ·05 and ·023 sq. in. feeders, and giving a local supply at 360 volts for motors and 210 volts for lighting.

The single-phase network is naturally the most extensive, and for obvious reasons it is mainly fed through the old Temple Back works. The latter works is coupled to the Avonbank plant by nine 2,000-volt single-phase trunk-feeders, and supplies 73 underground sub-stations, which, in turn, distribute over a 210-105 volt three-wire network. Two underground sub-stations and seven kiosks in the outlying districts of Westbury and Stoke Bishop are fed direct from Avonbank by means of boosted 3,000-volt single-phase current, distribution being by means of a 210-volt two-wire system.

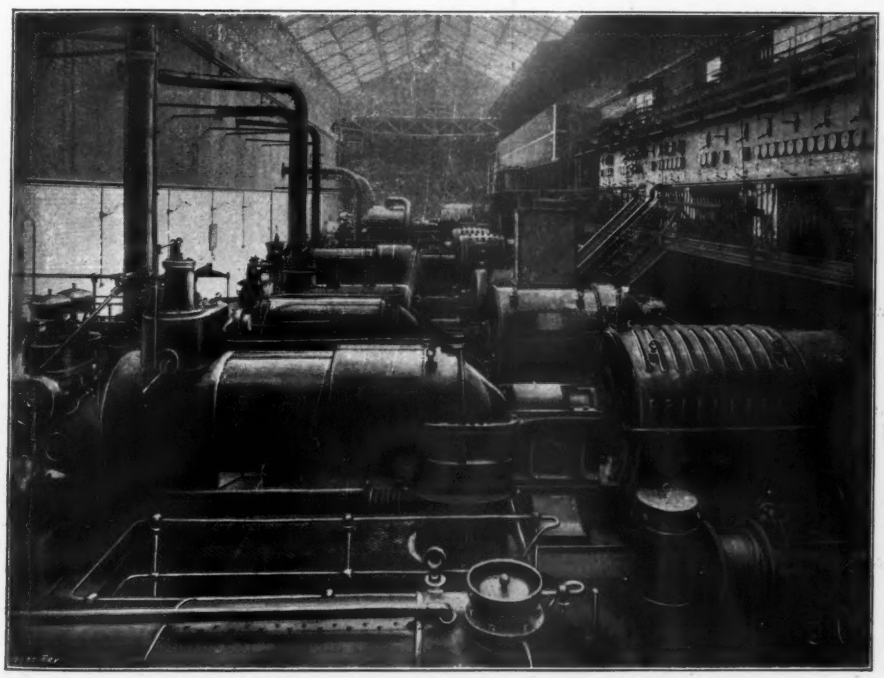


Fig. 6.—Turbine Plant Installed at the Avonbank Generating Station.

The single-phase cables are of the lead-covered and armoured type, laid direct; this system being in general use otherwise than for E.H.T. transmissions.

The single-phase sub-station feeders vary from ·1 to ·023 sq. in. section, and are of the double-concentric type, the distributors (triple-concentric) being for the most part ·15, ·075, ·15 sq. in. section. The total capacity of the static sub-stations is 5,500 kw., the largest being of

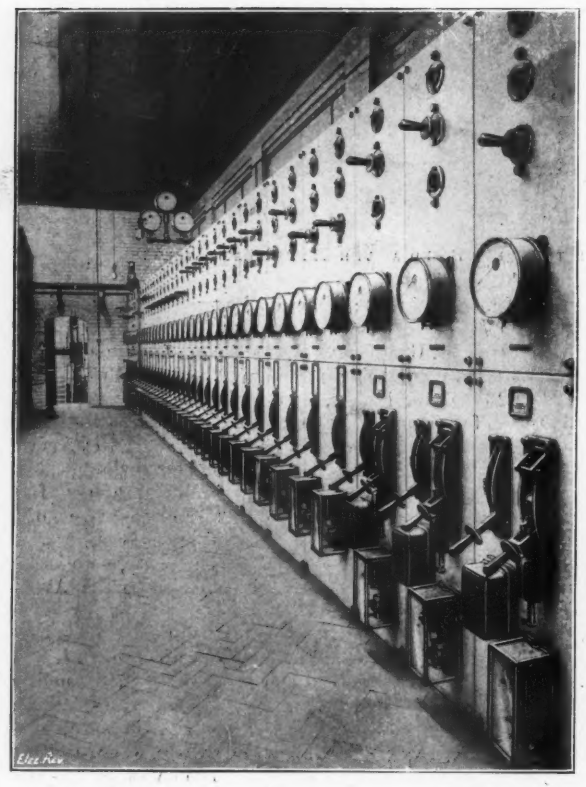
350-KW. and the smallest of 20-KW. capacity. As would be expected, many types of transformers are in use, but the Berry transformer is more generally adopted at the present time.

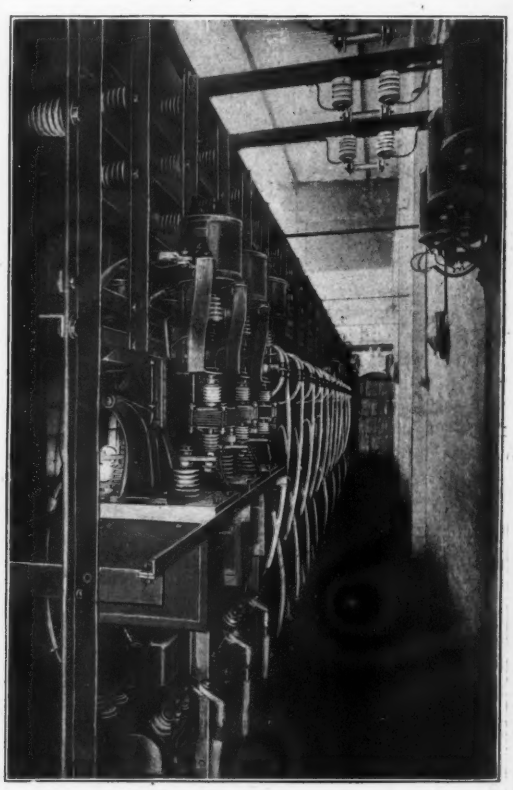
In addition to the foregoing, there is a very considerable direct-current cable network, with three-wire distribution at 500 and 250 volts pressure, this being supplied through the rotary sub-stations and direct from steam-driven plant at Avonbank and Temple Back, to some 22 feeding points, arranged in pillars and buildings.

The public lighting of Bristol is a well-known feature; no fewer than 700 arc lamps are employed in this service, approximately half the number being 10-ampere lamps run on special circuits from Temple Back, and the other half 5-ampere lamps run principally from the direct-current power network. Recently flame arcs have been substituted for the ordinary open-type lamps in certain areas, and there are now over 130 Oliver A.C. and D.C. flame arcs in use. In all, 26 miles of street are electrically lighted.

The approximate lengths of the various classes of cable in use are:—E.H.T., 51 miles; H.T., 101 miles; power feeders, &c., 31 miles; arc lighting, 75 miles; and L.T., 73 miles; making a total of 332 miles of cable in all. These particulars give some idea of the complexity of the Bristol electric supply cable network, which, it must be remembered, owes its apparent complication to the developments which have taken place during the past 17 years.

(To be concluded.)





FIGS. 7 AND 8.—VIEWS OF FRONT AND REAR OF ONE OF THE 2,000-VOLT SINGLE-PHASE SWITCHBOARDS INSTALLED AT TEMPLE BACK WORKS.

Westminster Electric Swimming Club.—The third annual dinner of this club was held at the Victoria Restaurant, Victoria Street, S.W., on Monday evening, the 1st inst., at 7.30. About 60 sat down to dinner. Mr. C. O. Grimshaw, chief engineer, was in the chair, with Mr. W. A. Jones, mains superintendent, vice-chair. They were supported by Capt. Edmund Bax (director), Mr. Frank Iago (secretary), and practically the whole of the staff of the corporation. Mr. L. H. Hordern, manager, was unavoidably absent through a severe chill. A very pleasant evening was spent, and great enthusiasm was shown when Capt. Bax presented the prizes.

THE EFFECT OF FOREIGN COMPETITION UPON BRITISH DESIGNS.

BY W. O. HORSNAILL.

WHATEVER disadvantages pertain to our Free Trade policy, there can be no doubt that as regards progress in the design of machinery in this country, great benefit has been derived from the importation of foreign goods and the incentive towards improved methods provided by foreign competition. This feature has been particularly marked in the electrical manufacturing industry—motors, switches, transformers and other electrical apparatus, made in other countries, having been taken to pieces and their designs carefully studied by British engineers. Then, again, competition from abroad has compelled home manufacturers to revise their products and processes. It is doubtful whether any other influence would have been powerful enough to effect this result; the chances are that if our manufacturers had not had the benefit of the object lessons provided by foreign goods, the machinery and appliances made in this country would never have reached their present state of perfection. As a country we have every advantage making towards cheap production, and if foreign manufacturers can undersell British undertakings in these islands, it necessarily follows that their designs and methods are superior to our own. No one who has been closely in touch with the development of electric motors, for instance, will deny that Continental electrical practice both as regards cost of manufacture and excellence of design was at one time ahead of the work being done in this country. This position has changed for the better during the last few years, the change having been mainly brought about by foreign competition and the lessons which have been learnt from a study of foreign designs.

Even at the present time it is doubtful whether we have quite caught up our Continental rivals. A study of the exhibits at Manchester last October cannot truthfully be said to have shown any general superiority of British goods, but the differences, if any, were small, and there is every reason to suppose that in the electrical, as well as in some other

industries, our own manufacturers will eventually turn out better and cheaper products than can be obtained elsewhere.

It is instructive to consider what has happened in other lines of manufacture when threatened with foreign competition. Thirty years ago the Americans were sending us large quantities of flour better in quality and lower in price than the home product. Such conditions might have been expected to ruin the British milling industry, and a few of the weaker firms were sent to the wall; the others not only adopted American practice, but improved upon it, with the result that we can now make cheaper and better flour than any country in the world.

English boot manufacturers were recently threatened with severe competition from the same quarter, and American boots began to be imported in appreciable quantities. Here, again, British enterprise rose to the occasion, and we now have little to fear from foreign competition in this line.

We still have implicit confidence in the British workman and the British manufacturer, and although certain industries are at the present time hard pressed by foreign competition, there is every reason to regard this state of things as a transition stage towards British supremacy, in every line unaffected by great natural advantages—such as cheap water power—possessed by other nations.

NOTES.

(*Continued from page* 260.)

Institution and Lecture Notes.—Royal Institution. At the monthly meeting held recently the treasurer announced that the sum of £10,000 had been anonymously and unconditionally placed at the disposal of the managers for the purposes of the Institution by a lady; and the members passed a resolution expressing their grateful appreciation of her munificence and discernment, accepting the gift as a timely and noble recognition of the good public works the Institution has done in the past, and is still doing, in the acquisition and diffusion of scientific knowledge, and as an incitement to maintain and extend its usefulness in the unique position which it has for more than a century occupied.

Junior Institution of Engineers.—At the January meeting of this Institution, the Honorary Member's Lecture was delivered by Dr. John T. Nicolson, M.Inst.C.E., of the Manchester University, who took as his theme "The Laws of Heat Transmission in Steam Boilers as deduced from Experiment." A large number of the members recently attended at the City and Guilds Central Technical College, South Kensington, when the Dean, Prof. W. E. Dalby, M.Inst.C.E., hon. member of the Institution, and the heads of the various departments showed them over the extensive laboratories and workshops.

British Science Guild.—The third annual meeting, which took place at the Mansion House recently, was well attended, and a masterly address was delivered by the president, Mr. Haldane, who impressed on his hearers the urgent necessity of interesting the public in the question of scientific education.

Royal Society.—The following were among the papers read last week:—

Dr. George C. Simpson, on "The Electricity of Rain and its Origin in Thunderstorms." Communicated by Dr. G. T. Walker, F.R.S.

W. Geoffrey Duffield. "The Effect of Pressure upon Arc Spectra. No. 3.—Silver. λ 4,000—λ 4,600." Communicated by Prof. A. Schuster, F.R.S.

G. Gerald Stoney. "The Tension of Metallic Films deposited by Electrolysis." Communicated by the Hon. C. A. Parsons, C.B., F.R.S.

A. A. Campbell Swinton. "A Further Note on the Conversion of Diamond into Coke in High Vacuum by Cathode Rays." Communicated by the Hon. C. A. Parsons, C.B., F.R.S.

Northampton Polytechnic Institute.—On Friday last the annual prize distribution and Students' conversazione took place at this Institute in Clerkenwell. The prizes, &c., were distributed by the Earl of Halsbury, P.C., who, after the ceremony, proceeded to the large lecture room in the new Court Yard Extension Building, which latter he duly declared open. As usual an attractive programme of lecturettes, organ recitals, laboratory and workshop demonstrations was arranged, one of the lecturettes being delivered by Dr. C. V. Drysdale on "Electric Oscillations." On the following night the annual conversazione of the Members and Students was held. During the evening there were two promenade concerts, and gymnastic, boxing and swimming displays, the various departments being again on view as equipped for ordinary work.

Coventry Engineering Society.—Mr. Henry F. Northcote gave an interesting address on Friday, January 29th, upon "Invisible Messengers," dealing, in conclusion, with wireless telegraphy.

Bradford Engineering Society.—Taking for his text a recent article in *The Engineer* on the generation of steam, Mr. A. W. Bennis, M.I.Mech.E., lectured before the Society on the 1st inst. on "Recent Developments in Machine Stoking." He divided mechanical stokers into four classes: sprinklers, intermittent sprinklers, cokers and chain grates, and underfeeds, and briefly described the principal forms in each class. The intermittent sprinkler type was first devised by Mr. Ed. Bennis in 1874, followed by Mr. J. Proctor in 1875; later the Bennis machine stoker and compressed-air furnace was invented, with tubular fire-bars, through which air is forced by fine jets of highly superheated steam. The amount of steam used for this purpose, in the most modern patterns, is 1½ per cent. or less. In the coking class the Vicars coking stoker was first devised, followed by the Hodgkinson stoker, Proctor's coker, and the "new Bennis patent high-temperature coking stoker." In the last, the usual dead-plate is replaced by a live-plate composed of little bars, above the main furnace; in the latter the outside air-bars do not move so far as the rest, so that there is always a white-hot fire near the front at both sides, and the fuel fed across the fire is lighted up within a few inches of the "live dead-plate" bars. Falling from the latter, the partially-coked fuel is broken up, making the fire-bed porous instead of semi-solid, and permitting air to pass through it freely. Chain-grate stokers, to be smokeless, must work under a long brick arch. The Babcock & Wilcox type, and the Bennis type with Miller-Bennett links, were described; these special links are halved together and rounded at their ends, so as to leave no opening, even at the ends, into which ashes or clinker can fall, or through which excess of air may pass. At the back end, instead of a dumping plate, there is an air seal, and patent side air seals are also provided. Underfeed stokers, which are really of the coking stoker class, are made by two firms—the Underfeed Stoker Co. and the Erith Underfeed Stoker Co.—and require forced draught.

Dealing generally with the great importance of economy of fuel under modern conditions, the author quoted an article by Mr. W. H. Booth in the Electrical Review of September 4th, 1908, and detailed various points which, if neglected, led to serious loss, such as air leakages through brickwork and economiser chain holes. Coal and ash handling plant are indispensable features of a modern boiler house, even of small size. Immense progress has been made towards the perfecting of boiler-house plant during the last few years.

Association of Technical Institutes.—On Friday last the sixteenth annual general meeting of this Association was opened, Dr. G. T. Beilby presiding, in succession to Sir Norman Lockyer. The new president emphasised the necessity of research work in all industries, and in technical colleges.

I.E.E. (Glasgow).—The annual smoking concert of this Section was held in the Banqueting Hall of the Grosvenor, on Saturday last, February 6th, with Mr. W. W. Lackie as chairman.

Mr. A. A. Day, borough electrical engineer, Bolton, gave a lecture on Monday last week at Messrs. Dobson & Barlow's Kay Street Engineering Works, Bolton, on "Electrical Progress." Mr. Day, in the course of his lecture, said electric driving in cotton mills would eventually prove very advantageous, and was bound to develop most materially.

Institution of Electrical Engineers (Students).—The annual dinner will be held at the Holborn Restaurant on Thursday next. We understand that the guests are to include amongst others, the President (Mr. Mordey), Dr. G. Kapp, and Dr. S. P. Thompson. We have further been informed that Mr. Selwyn Driver (the well-known humourist) has been secured to assist in the musical programme. For further particulars students should apply to Mr. Geo. H. Stevens, 266, Barry Road, Dulwich, S.E.

Electric Shock Fatality.—While engaged along with a journeyman in fitting up electrical appliances in the Anchor Thread Mills, Paisley, Daniel M'Iver (15), apprentice electrical engineer, came into contact with a live wire. M'Iver was killed almost instantly. The lad had been an apprentice for six weeks only, and was in the service of a Glasgow firm.

Tramcar Accident Claim.—The Under-Sheriff of Newcastle-on-Tyne sat with a special jury at the Newcastle County Court on 5th inst., to assess the damages which Cleveland Randal Schmitz, an engineer, was entitled to recover from the Newcastle Corporation in respect of an injury received by him in a tramway accident on October 1st, 1908. The action had been remitted from the High Court, defendants having admitted liability. It was stated that on October 1st, 1908, the plaintiff was injured while travelling in a car, which collided with another tramcar. His business was the extraction of certain minerals from puddler's heaps, which latter he bought. In consequence of the accident, he was unable to follow his employment for a considerable time. Plaintiff gave evidence as to being unable to do his accustomed work, and after hearing medical evidence, the jury assessed the damages at £175.

Nickel-Steel for Electric Lamps.—In a paper read before the French Society of Civil Engineers recently, it was stated that an alloy allied to "Invar" had been invented with the same coefficient of expansion as glass, and had been employed for the leading-in wires of incandescent lamps.

Electrically-Driven Gas Works.—At the meeting of the Gas Light and Coke Co. last week the chairman, in referring to the reconstructed works at Fulham, said that the retort house, fitted with electrically-driven machinery, was at work.

The Electrical Benevolent Fund Dinner.—It has been found necessary to alter the date of the above event from March 19th to March 30th, as the dinner of the Institution of Civil Engineers takes place on the former date. It is to be hoped that no further clashing of dates will occur.

Secretaryship of the Institution of Electrical Engineers.—We are informed that Mr. P. F. Rowell, assistant secretary of the I.E.E., has been appointed by the Council as secretary of the Institution, in succession to Mr. G. C. Lloyd. We tender our congratulations to Mr. Rowell, whose admirable qualities will ensure his popularity, and we wish him every success in the important post to which he has been called.

Appointments Vacant.—Assistant junior demonstrator for the electrical engineering laboratories at Northampton Polytechnic Institute (£80). See advertisement in this issue.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Stations Officials.—The sixth annual dinner of the Carlisle Electricity Department was held on February 4th, under the chairmanship of Mr. S. T. Allen, city electrical engineer. Supporting him were Mr. Alderman Johnstone and Dr. Overton (chairman and vice-chairman of the Electricity Committee), Mr. Holroyd, local manager N.T. Co.; Mr. McNee, tramway manager; Mr. Wilson, tramways engineer; Mr. Kettridge, Electrical Illuminating Co.; Mr. Brooking, of Messrs. Glover's; Mr. Lowe, of Messrs. Crompton & Co.; Mr. Thompson, Mr. Deighton and Mr. Moberly, of the staff. After dinner and "The King's" toast, Mr. Allen proposed "The Committee," which was honoured musically. In replying, Alderman Johnstone said that they considered that in Mr. Allen they had a very good chief. Dr. Overton proposed "The Staff," and Mr. Thompson, station superintendent, replied. "The Visitors, Contractors and Consumers" were proposed by Mr. Moberly, mains superintendent, who spoke of them in reference to the undertaking as not blood, but "juice," relations, and alluded to the good feeling existing between all such electrical connections. The toast was replied to by Mr. Brooking. Mr. Kettridge replied for the Contractors, and Mr. McNee for the Tramway Co. as one of the largest consumers. A musical programme was provided, in which Mr. Brooking, Mr. Kettridge and Mr. McNee assisted. For table decorations garlands of electrically-illuminated flowers specially supplied by Messrs. Pirrie, and several table standards, were tastefully arranged by the Electrical Illuminating Co.

MR. F. A. WILKINSON, the electrical engineer and manager at St. Marylebone, has resigned his appointment in order to take up private practice. He has entered into an arrangement under which he remains at Marylebone until the end of September, or for six months after his successor takes up his full duties, whichever is the later date. He is now at liberty to carry out such private work as will not unreasonably interfere with his duties at Marylebone. Mr. Wilkinson intends to devote his attention particularly to colliery work, electric battery traction, electric heating and cooking, &c., following up the work that has been carried out in the last-named direction in Marylebone.

On Thursday last week the Swansea Harbour Trustees appointed MR. DAVID FULTON, electrical engineer to the South Durham Iron and Steel Co., to the position of Harbour electrical engineer at Swansea, at a salary of £250 a year.

MR. W. A. BARNETT, charge engineer at the Gillingham (Kent) electricity works, has resigned.

MR. E. L. ROSSITER, A.M.I.E.E., who has been superintendent of the Melbourne City Council's electric supply station for the past seven years, has tendered his resignation, and has taken up the position of managing engineer to the firm of Messrs. J. Kitchen and Sons, of Melbourne, Sydney and Adelaide. He was presented on retiring with a silver salver suitably inscribed, and a silver jardiniére, as a token of esteem by the officers and staff of the Electric Supply Department.

Hereford City Council has increased the salary of MR. KERR, electrical engineer, from £200 to £300 per annum, with leave to apply for a further increase a year hence. Mr. Kerr had received an offer of a post in India at a salary of £400, rising to £600 per annum.

The staff and employés of the Cambridge Electric Supply Co., Ltd., have presented a spirit tantalus to MR. H. B. HARVEY, manager and engineer since 1901, who is leaving to become manager and engineer to the Kent Electric Power Co. His successor is MR. PIERCE.

General.—MR. LEE MURRAY, who has resigned his position of manager at Messrs. Siemens Bros. Dynamo Works, at Stafford, in order to take up a post with Messrs. Bruce Peebles and Co., Ltd., was on Saturday last, presented with a grandfather clock, and an album containing the names of all subscribers. The latter included practically every one of the hands—about 1,000. When the presentation was made the audience numbered 1,800. Mr. T. E. Ingoldby, assistant manager, presided, and he was supported by Mr. F. W. Schiller, chief engineer. After leaving the hall, Mr. Murray was met by an open landau, in which he was drawn to his residence by a number of the employés who bore torches. Some 200 or 300 other torch-bearers preceded or followed the carriage. Mr. Murray subsequently concluded his farewells from an upper window.

We regret to learn from the *Times* that the MARQUIS OF TWEEDDALE was taken seriously ill at his town residence last week. An improvement is reported.

We regret to hear that MR. HARRY W. COX, whose name will be familiar to many of our readers as that of one of the first manufacturers of X-ray apparatus in this country, and a very assiduous worker in that department of electrical or electro surgical research, last week underwent a second operation from X-ray dermatitis, three fingers being removed from his right hand. Some years ago Mr. Cox lost a finger from his left hand. He has also contracted the disease in the chin.

M. HENRI POINCARE has been elected a member of the French Academy.

Obituary.—The death occurred recently, at the age of 68 years, at Portsmouth, of MR. A. W. WHITE, who was connected with the Cosham to Horndean light railway, and was a director of a number of other electric tramway companies in the South of England.

The death is announced of COLONEL A. J. FILGATE, late R.E., chairman of the Calcutta and Hove Electric Supply Companies. He passed away on Tuesday in London, at the age of 71.

NEW COMPANIES REGISTERED.

Manaos Tramways and Light Co., Ltd. (101,081).—This company was registered on January 12th, with a capital of £300,000 in £1 shares, to adopt an agreement with Antonio de Lavandeyra and the Municipal and General Properties Syndicate, Ltd., to acquire any tramways, railways or running powers, licences, rights or easements, and to carry on the business of manufacturers and repairers of and dealers in railway, tramway, lighting, electric, magnetic, galvanic and other plant and apparatus, rolling stock, vehicles, &c. The subscribers (with one share each) are:—E. A. Borel, 24, Boundaries Mansions, Balham, S.W., accountant; E. F. Juniper, 17, Beresford Gardens, Seven Kings, cashier; J. Fry, 45, Crossley Street, Highbury, clerk; O. S. Penton, 32, Lansdown Road, Lee, S.E., clerk; H. Spinks, 37, Fletching Road, Clapton, N.E., clerk; H. W. Brown, 63, Mackenzie Road, Beckenham, clerk; E. S. Harper, 17, Chevening Road, Kensal Rise, clerk. Minimum cash subscription, seven shares. The number of directors is not to be less than three or more than seven; the first are W. C. Burton, 9, Cloak Lane, E.C.; G. M. Booth, Adelphi House, Adelphi Terrace, Strand, W.C.; and J. Mitchell, Claudjes Hotel, Grosvenor Square, W.; qualification, £500; remuneration, £150 each per annum (chairman £250).

Globe Code Co., Ltd. (101,167).—This company was registered on January 19th, with a capital of £100 in £1 shares, to carry on the business of compilers, printers and publishers of telegraphic, cable, cipher and other codes and messages, general translators of code and cipher messages, &c. The subscribers are:—Mrs. L. L. Opitz, Streathbourne Road, Upper Tooting, S.W., 66 shares; G. B. Opitz, 1, Streathbourne Road, Upper Tooting, S.W., code specialist, 1 share; B. H. A. Opitz, Lynmouth, Woodnook Road, Streatham, S.W., code expert, 33 shares. Private company; the number of directors is not to be less than two or more than five; G. B. Opitz is permanent managing director and chairman; remuneration as fixed by the company. Registered by Morton & Patterson, 10, Old Jewry Chambers, E.C.

Goring and Streatley Electric Light and Power Co., Ltd. (101,223).—This company was registered on January 22nd, with a capital of £3,000 in £1 shares (1,500 preference) to acquire the Goring electric light undertaking, and to carry on the business of suppliers of electricity for light, heat and power, electrical engineers, &c. The subscribers (with one preference share each) are:—J. A. Dyster, 125, Winston Road, Stoke Newington, N., umbrella manufacturer; F. W. Jennings, 170, Marlborough Road, Hornsey Rise, N., secretary. Private company. The number of directors is not to be less than two or more than five; the first are F. A. Dyster and J. W. Jennings; qualification, 10 shares; remuneration as fixed by the company. Registered office, the Works, Goring Mill, Goring-on-Thames, Oxford.

London Electric Wire Co. & Smiths, Ltd. (101,353).—This company was registered on January 30th, with a capital of £420,000 in £5 shares (14,000 preference), to acquire (1) the undertaking of the London Electric Wire Co., Ltd., together with shares in that company, and (2) the Salford undertaking of Frederick Smith & Co., Wire Manufacturers, Ltd., to adopt agreements (1) with the London Electric Wire Co., Ltd. and W. H. Willey, the liquidator thereof, and (2) with F. Smith (on behalf of Frederick Smith & Co., Wire Manufacturers, Ltd.), and to carry on the business of wire manufacturers and coverers, cable makers, electrical engineers, makers of machinery, tools and appliances for telegraphs, telephones and other electrical purposes, &c. The subscribers (with one share each) are:—T. Willey, M.D., Saxmundham House, Swanage; A. L. Don, 2, North Grove, Highgate, N., gentleman; F. Leete, Trefusis, Kenley, Surrey, gentleman; F. Smith, Dunham Lawn, Bowdon, Cheshire, electrical engineer; W. H. Willey, 7, Playhouse Yard, Golden Lane, E.C., electrical engineer; A. N. Smith, Anaconda Works, Salford, electrical engineer; W. C. Jackson, 58, Coleman Street, E.C., chartered accountant. Minimum cash subscription seven shares. The number of directors is not to be less than three or more than nine: the first are T. Willey, M.D., A. L. Don, F. Leete, F. Smith, W. H. Willey and A. N. Smith; qualification one share; remuneration, £200 each per annum (chairman £250). Registered office, 7, Playhouse Yard, E.C.

Telegraph and Telephone Instruments, Ltd. (101,359).—This company was registered on January 30th, with a capital of £6,000 in £1 shares, to carry on the business of electricians, manufacturers of telegraphic and telephonic instruments, dynamos and accumulators, &c., and to adopt agreements (1) with A. W. Sharman and others; (2) with W. Watson & Sons, Ltd.; and (3) with J. L. Walter. The subscribers (with one share each) are:—Lieut.-Col. J. B. Bernard, 46, Ashley Gardens, S.W., R.M.L.I.; Capt. C. M. Gonne, 9, Fernshaw Mansions, Fernshaw Road, S.W., R.A.; J. H. Webb, 4, Ruskin Walk, Herne Hill, S.E., electrical engineer; C. Baker, 85, Gresham Street, E.C., solicitor; A. W. Rippon, 85, Gresham Street, E.C., clerk; R. J. R. Warner, 7, Royal Avenue, Chelsea, S.W., gentleman; A. Baker, 85, Gresham Street, E.C., solicitor. Private company. Table "A" mainly applies. Registered by Baker, Baker & Co., 85, Gresham Street, E.C.

Imperial Lamp Works (Brimsdown) Ltd. (101,306).—This company was registered on January 27th, with a capital of £1,000 in 5s. shares, to take over the business of manufacturers of and dealers in electric lamps and fittings carried on at the Imperial Works, Brimsdown, Middlesex, and to adopt an agreement with A. A. Flurscheim (trading as the Power Plant Construction Co.). The subscribers (with one share each) are:—J. R. Cardew Smith, 13, Bedford Row, W.C., solicitor; J. P. Lyne, 24, Oakbank Grove, Herne Hill, S.E., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first; qualification, 100 shares; remuneration as fixed by the company. Registered by J. R. Cardew-Smith, 13, Bedford Row, W.C.

Pope's Electric Lamp Co., Ltd. (101,293).—This company was registered on January 26th, with a capital of £25,100 in £1 shares (25,000 preference), to take over the business of electrical lamp manufacturers and merchants carried on by Emile Goossens, F. R. Pope and M. W. O'Connell, as "Pope's Electric Lamp Co.," at 9, Hythe Road, Willesden. The subscribers (with one share each) are:—M. W. O'Connell, 35, Nicoll Road, Harlesden, N.W., electrical engineer; F. R. Pope, The Priory, Harlesden Road, N.W., electrical engineer. Private company. The first directors are F. R. Pope, M. W. O'Connell and E. Goossens; qualification, £1,000; remuneration of F. R. Pope, M. W. O'Connell and E. Goossens, £250, £250, and £125 per annum respectively. Registered by W. H. Martin & Co., 15, King Street, E.C. Registered office, 9, Hythe Road, Willesden, N.W.

Southam & Wood, Ltd. (101,263).—This company was registered on January 25th, with a capital of £2,000 in £1 shares, to carry on the business of designers, manufacturers of and dealers in electric light apparatus, conduits, dynamo machines, lamps, fittings and accessories, &c. The subscribers (with 195 shares each) are:—J. C. Wood, Sheffield House, 162, Oxford Street, W., engineer; A. D. Southam, Sheffield House, 162, Oxford Street, W., engineer. Private company. The joint managing directors are A. D. Southam and J. C. Wood; qualification, £100; remuneration as fixed by the company. Registered by Alfred H. Atkins, Ltd., 27-8, Fetter Lane, E.C.

Power Investment Trust, Ltd. (101,433).—This company was registered on February 4th, with a capital of £30,000 in £1 shares (20,000 5 per cent. non-cumulative preference), to acquire from time to time shares, stocks and securities from William P. Bonbright & Co., and to carry on the business of bankers, capitalists, financiers, concessionaires, merchants, dealers in stocks, shares, debentures, debenture stock and other securities, &c. The signatories are:—R. N. Grenfell, 16, George Street, Mansion House, E.C., merchant, 100 ordinary shares; L. Egerton, Chilton House, Thame, stockbroker, 100 ordinary shares; W. G. Dunstall, 2, Norfolk Street, Strand, W.C., secretary, 1 ordinary share; Lord Fairfax, 16, George Street, Mansion House, E.C., merchant, 100 ordinary shares; R. B. Phillpotts, 4, Bishopsgate Street Within, E.C., solicitor, 1 ordinary share; W. Hicks, 5, Oxford Gardens, W., solicitor, 1 ordinary share; F. Birch, 4, Kenton Avenue, Harrow-on-the-Hill, solicitor, 1 ordinary share. Minimum cash subscription, 10 per cent. of the shares offered to the public. The first directors (to number not less than three or more than five) are R. N. Grenfell, L. Egerton, Lord Fairfax and W. F. Fisher. In the event of either of the above directors ceasing to act before the general meeting in 1913, William P. Bonbright & Co. may appoint a successor; qualification, £100 ordinary shares; remuneration, £100 per annum, divisible. Registered office, 15, George Street, E.C.

P. C. and H. Syndicate, Ltd. (101,343).—This company was registered on January 29th, with a capital of £12,000, in 10,000 ordinary shares of £1 each, and 40,000 deferred shares of 1s. each, to undertake the construction, establishment, maintenance, management and working of any public or private tramway or light railway in any part of the world, &c. The subscribers (with one ordinary share each) are:—W. F. C. Kelly, B.A., St. Albans, Uplands Road, Leigh-on-Sea, barrister, director of Self-Development Plate Co., Ltd., and Kelly & Bentham, Ltd.; T. E. Morley, Sutton House, Bedford Hill, Balham, S.W., gentleman; Hon. B. H. Innes Ker, Travellers' Club, Pall Mall, S.W.; H. J. Dixon, 77, Alexandra Road, N.W., secretary. Private company: the number of directors is not to be less than two or more than seven; the first are to be appointed by the subscribers; remuneration as fixed by the company. Registered by Thys & Saunders, 79, Salisbury House, E.C.

Sterling Telephone and Electric Co., Ltd. (101,415).—This company was registered on February 3rd, with a capital of £265,000 in £1 shares (49,650 6 per cent. cumulative participating preference, and 15,350 ordinary), to carry on the business of telephonic, electrical and mechanical engineers, suppliers of telephonic apparatus, and of electricity for all purposes, &c. The subscribers (with one share each) are:—A. G. Cooper, 15, Cowley Road, North Brixton, S.W., book-keeper; H. T. Jarman, 158, Mill Lane, N.W., clerk; C. E. Sherwood, 3, Tanza Road, Hampstead, N.W., secretary. Private company. The number of directors is not to be less than two or more than five. So long as the Telephon Fabrik Actien Gesellschaft vormals J. Berliner hold 10,500 shares, they may nominate two directors. Registered office, 200, Upper Thames Street, E.C.

Electric Pulley-Block Co., Ltd. (101,442).—This company was registered on February 5th, with a capital of £2,000 in £1 shares, to adopt an agreement with A. A. C. Gese, and to carry on the business of electrical and general engineers, founders, &c. The subscribers (with one share each) are:—A. A. C. Gese, Nordstr., 68, Bremen, Germany, engineer; A. W. S. Pocklington, 109, Victoria Street, Westminster, electrical engineer; T. Petersen, Hamilton House, Victoria Embankment, E.C., engineer. Private company. The number of directors is not to be less than two or more than five: the first are A. A. C. Gese, A. W. S. Pocklington and T. Petersen. Registered office, 109, Victoria Street, Westminster.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Adams Manufacturing Co., Ltd. (Motor, mechanical and electrical engineers, &c., London) (84,224).—Particulars of £15,000 debentures secured by trust deed dated January 8th, 1909, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £7,500. Property charged: The company's undertaking and assets, present and future, including freehold land and buildings in Bedford and leasehold premises in London. Trustees: Sir John L. Harrington and L. Hardy.

Thomas Potter & Sons, Ltd. (Electrical and general engineers, London) (84,541).—Assignment on December 14th of book debts due to the company from the Hackney Guardians, to secure not more than £100. Holders: National Provincial Bank of England, Ltd., Putney, S.W.

Roger Dawson, Ltd. (Electricians, &c., London) (74,635).—Two mortgages and charges under Land Transfer Acts, both dated December 24th, 1902, to secure (*a*) £3,750 and further advances, and (*b*) £2,800. Property charged in both cases: Leasehold premises, No. 1, Berners Street, W., and sinking fund policy for £10,000, payable on June 18th, 1948. Holders: (*a*) O. Nettlefold and (*b*) J. Chessum & Sons.

Coast Development Corporation, Ltd. (London) (84,631).—Mortgage dated January 6th, 1909, to secure £2,500, charged on electric lighting station at Walton-on-the-Naze and benefit of Electric Lighting Order applied for. Holder: G. B. Paul, Billiter House, Billiter Street, E.C.

This company's annual return, made up to July 29th, was filed on December 17th. 32,618 1st preference, 118,076 2nd preference, and 45,640 ordinary shares have been taken up out of a nominal capital of £216,000 in 50,000 1st preference, 120,000 2nd preference and 46,000 ordinary shares of £1 each. £1 per share has been called up on 32,618 1st preference, resulting in the receipt of £30,827 17s. 6d., £1,799 2s. 6d. remaining in arrears. £163 7l6 is considered as paid on 118,076 2nd preference and 45,640 ordinary. Mortgages and charges, £87,876.

Venezuela Telephone and Electrical Appliances Co., Ltd. (81,305).—Particulars of £20,000 2nd debentures created March 7th, and secured by trust deed dated April 7th, 1898, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £1,500. Property charged: The company's undertaking and property, including telephone systems in and connected with the cities of Caracas, La Guaira, Puerto Cabello and Valencia, and certain trunk lines. Trustees: Premier Investment Co., Ltd.

Rhondda Tramways Electric Supply Co., Ltd. (94,470).—Issue on January 11th of £6,100 debentures, part of series created to secure £44,000, particulars of which have already been filed.

British Columbia Electric Railway Co., Ltd. (51,953).—Particulars of debenture stock created January 28th, 1907, to secure not more than the amount paid or credited as paid on the shares, and secured by a trust deed dated February 23rd, 1907 (already registered), filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £500,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. Trustees: British Empire Trust, Ltd.

CITY NOTES.

Electric Supply Corporation, Ltd.

THE directors' report for the year ended December 31st, 1908, states that the gross revenue amounts to £21,239 as against £16,741 received from the company's general business in the various towns in the previous year, being an increase of over 25 per cent.

It will be remembered, however, that in addition to the £16,741 derived from the general business of the company in 1907 there were further gross receipts amounting to £3,543 arising from the working of the Dumbarton Tramways, which the last annual report stated would not occur again. During the year 1908 the company has, however, received an interim dividend upon its holding of 8,820 £1 6 per cent. preference shares in the Dumbarton Burgh and County Tramway Co., Ltd., and the directors anticipate that in addition to earning the full dividend on these shares the Tramway Co. will during the current year be able to show a substantial surplus.

As the company holds in addition to the 8,820 preference shares 29,490 ordinary shares, the board views the successful development of the Dumbarton Burgh and County Tramway Co. with much satisfaction.

The sum brought into net revenue account as the result of the year's working amounts to £6,566, made up as to £6,335 from the company's supply business, and as to £230 from a dividend received from the Dumbarton Tramway preference shares, compared with £5,456 in the preceding year, made up as to £4,262 from the company's supply business, and as to £1,194 from the tramways and various payments received in connection therewith. After meeting debenture interest (£2,956) and interest on temporary loans (£1,649), there remains a surplus of £2,397, as compared with the balance £401 in 1907. As foreshadowed at the last annual general meeting, further funds are required to repay bankers' loans and temporary advances, and to continue the development of the company's business. The debenture stockholders have, at the request of the company, passed a resolution in general meeting on January 7th last, giving their consent to the issue of further debenture stock to an amount not exceeding three-fourths of the issued capital—such additional stock to rank *pari passu* with that already outstanding—and as a consideration for this concession the interest upon the whole issue is to be in future at the rate of 5 per cent per annum. The directors will therefore ask the shareholders to increase their borrowing powers, and a resolution will be submitted at the meeting for this purpose. The Hendon Electric Supply Co. Ltd. (in which the company holds 4,793 out of the 5,000 shares issued), is making rapid progress, and is fulfilling anticipations. The first year's working of that company has resulted in the equivalent of 12,600 8 C P. lamps being connected to its mains. The following generating stations belonging to the company were completed and in working order at December 31st, 1908:—

	Supply Commenced.		Lamps Connected. (Equiv. 8-C.P.) 1907.	1908.	Increase Lamps.
Chelmsford	April 14th, 1890		23,982	26,693	2,711
Jedburgh	Dec. 1st., 1903		3,257	3,347	90
Melrose	Jan. 11th, 1904		2,677	2,897	220
Dalkeith	Mar. 5th, 1904		4,699	4,952	253
Dollar	Mar. 19th, 1904		1,707	1,821	114
Totnes	May 31st, 1904		2,825	3,263	437
Exmouth	April 10th, 1905		7,276	9,086	1,810
St. Andrews	June 3rd, 1905		11,961	13,437	1,576
Hitchin	April 1st, 1906		4,144	6,226	2,082
*Dumbarton	April 13th, 1906		14,281	19,547	5,266
Falmouth	Dec. 7th, 1906		4,845	6,510	1,665
			81,654	97,778	

Total increase, 716,324

* These figures do not include the supply to the Dumbarton Burgh and County Tramway Co., Ltd.

Held Over.—Owing to very heavy demands upon our space this week, we are compelled to hold over a number of company reports and meetings.

Telegraph Construction and Maintenance Co., Ltd.—The directors propose, subject to audit, a dividend of 10 per cent. (£1 4s. per share), in addition to the 5 per cent. already paid, making 15 per cent. for the year 1908. Last year the total distribution was 17½ per cent.

Anglo-American Telegraph Co., Ltd.

THE meeting of this company was held on Friday last at Winchester House, Old Broad Street, Mr. R. H. Benson presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, January 29th, page 189), said that the traffic receipts showed a decrease of £5,423. The working expenses had increased by £5,080. That was principally accounted for by an expenditure of £4,620 for the chartering of a ship for the repair of a cable which was damaged off Valencia. Four-fifths of the damage to cable was on the other side of the Atlantic. The net amount available for distribution was £68,065, out of which the directors proposed to pay a dividend of 19s. per cent. on the ordinary shares, 30s. per cent. on the preferred, and 8s. per cent. on the deferred. Comparing the figures of 1907 with this year

there was a sum of £21,913, less profit available for distribution. The directors so as to get some idea of the rise and fall of the company's business had taken out the figures for the last 13 years. Starting with 1896, which was the year of the Silver Panic, their gross profit was £324,000, and the net £185,000; for 1899, the gross was £410,000, and the net £250,000. The following years showed a gradual decrease until the year 1900, when the receipts were down to £251,000, and the net £195,000. From 1900 there was a gradual expansion, which culminated in 1906, when the gross receipts were £415,000, and the net £247,000; whilst last year there was a decrease to £247,000 gross, and £225,000 net. With regard to the revenue, their securities, which were last year valued at £91,000, had fallen to £79,000, and the directors had, therefore, decided to set aside £20,000 for reserve. It was very necessary in view of the fact that they had cables which were laid in 1873 and 1874, that they should set aside an adequate sum for renewals. Their 1874 cable broke on December 19th last, but they had not been able to repair it owing to the wintry weather. The operations for that purpose would be resumed in the first week in April. Speaking in reference to the agitation for 1d. a word cablegrams, the chairman said that, as they knew, it had been decided to have a conference of the British Colonies on the matter, and they had received the assurance from the Postmaster-General that the North Atlantic companies would have an opportunity of expressing their view before that conference, and consideration would be given to any proposals which were suggested by them before anything was definitely adopted. It must be borne in mind that the opening of telegraphic communication between the British Colonies had been left to private enterprise, and in anything that was done regard should be had to that aspect of the matter. A similar agitation was raised seven years ago, and an inter-departmental committee appointed. That committee in their report said that they were firmly convinced that the question of cable communication was of paramount importance, and that the great network of British-owned submarine cables which extended over the world should continue to be remunerative to those whose enterprise had created it. Further, the Committee stated that the Atlantic companies had not formed the subject of much public controversy. They had received no subsidies; they provided under influence of competition an efficient service at a low rate (which they had attempted, though unsuccessfully, to reduce still further) and no complaint against the companies had been laid before them. That company felt that during the 50 years of their existence they had had a duty to perform, and that they had done it well. When the Government decided to reduce the rates, they should deal fairly with those who had carried on the work for many years without Government assistance. That company when they started had only one line across the Atlantic; now there were six companies owning 16 cables. There were two English companies, two American, one German and one French company, and the rates were as low as 1s. a word. That was 1s. a code word, and he had known a code word to contain when it was translated as many as 70 or 80 ordinary words, so that that was six words for a penny. Public policy demanded that a business like theirs should be built up and not pulled down. It would be a hardship if the thrifty shareholders were to be interfered with by the introduction of the penny-a-word messages.

Sir Charles Burt seconded the motion, and after a short discussion the report was adopted.

Charing Cross, West End and City Electricity Supply Co., Ltd.

The report of the directors for the year ended December 31st, 1908, reads as follows:—

West End Undertakings.—The gross earnings of these undertakings from sales of current, rents, &c., were £139,253, as compared with £131,921 in 1907, the expenses, including depreciation, being £87,785, as compared with £80,114 in 1907, leaving net earnings of £51,468, against £51,806 in 1907. After bringing in the balance of £4,023 from 1907 and £5,502 for interest accrued in 1908, and paying interest on the debenture stock, there is a balance on net account of £43,164, out of which has been paid the dividend for the year on the preference shares, amounting to £18,000, also an interim dividend for the first half-year at the rate of 5 per cent. per annum on the ordinary shares, amounting to £10,000, leaving a balance to be dealt with of £15,164. The directors recommend that a final dividend be paid on the ordinary shares for the second half-year at the rate of £5 per cent. per annum, making £5 per cent. for the whole year, absorbing £10,000, and that there be carried forward £5,164, as against £4,023 last year. The company has now connected to its West End mains a total equivalent of 579,492 8-c.p. (or 30-watt) lamps, or an increase of 40,528, as against 28,375 added last year. The total is made up as follows:—412,900 in lighting, 13,317 in heating, and 153,275 (6,131 h.p.—4,574 kw.) in motive power. In addition, a bulk supply is being furnished to the L.C.C. at their station on the Victoria Embankment.

City Undertaking.—The gross earnings of this undertaking from sales of current, rents, &c., were £131,013, as compared with £118,543 in 1907, the expenses being £76,562, as compared with £63,748, leaving the net earnings £54,451, as compared with £54,795. After bringing in the balance of £2,256 from 1907, and paying interest on the debenture bonds, debenture stock and temporary loans, there is shown a balance on net revenue account of £23,110, out of which has been paid the dividend on the preference shares amounting to £18,000, leaving to carry forward £5,110, as against £2,256. The 5 per cent. debenture bonds of the City undertaking matured on January 15th last, and have been redeemed. The company has now connected to its City mains the total equivalent of 494,783 8-c.p. (or 30-watt) lamps, which is an increase of 40,026 upon last year's figures. The total includes 295,201 in lighting, 30,057 in heating, and 169,525 (6,781 h.p., 5,058 kw.) in motive power. The company are also furnishing a bulk supply to the Smithfield Markets Electric Supply Co., Ltd.

The chief engineer certifies that the plant and machinery at the several stations of the company have been maintained in a high state of efficiency.

The directors refer with satisfaction to the legislation of last year affecting the electrical industry. The Bill of the London and District Electricity Supply Co. was rejected, while the Bill promoted by this company (in conjunction with eight of the other London companies) received the Royal Assent, and thus became an Act of Parliament in December last.

Under this Act, power to link up their systems is for the first time given to the electric lighting companies and local authorities in London holding provisional orders.

The power of purchase of the company's undertakings under the Electric Lighting Act of 1888 was exercisable by the several local authorities, and this power is, under the Act of last session, transferred to the London County Council.

It is exercisable in 1931, and at the end of each subsequent term of ten years. Three years' notice of the intention to purchase has to be given, and provision is made under which an obligation is put upon the London County Council to supply capital necessary for carrying on the undertakings after the giving of such notice.

The purchase powers of the City of London Corporation under the City provisional order are preserved until 1927, and after thatdate the City undertaking becomes purchasable by the London County Council in 1931, but the special powers of purchase under the order are expressly preserved, so that if the undertaking be purchased either by the City Corporation, prior to 1927, or by the London County Council in 1931, the price will be the payment of the capital properly expended on the undertaking, with 10 per cent. in addition, and the making up of deficiency in revenue, if any, to 4 per cent. per annum. In each case the purchase-moneys payable to the company will, subject to the City undertaking loan capital and City undertaking preference shares, inure for the benefit of the shareholders of the West End undertaking.

The Act also authorises the company within its areas to supply railways, dock companies and others with electric energy for haulage and traction for use within and without its areas of supply.

West End Undertakings.

Generated, in B.O.T. units	6,087,846
Bought, in B.O.T. units	11,665,500
Sold:—Public lamps	458,992
Other sales	12,124,866
Totals sold, B.O.T. units	12,583,858
Used on works, and transmission and distribution losses	5,169,488
Total accounted for	17,753,346
Number of public lamps	166
Total maximum supply demanded, kw.	6,485

City Undertaking.

Generated, in B.O.T. units	25,342,770
Bought, in B.O.T. units	1,554,134
Sold	22,345,275
Used on works, and transmission and distribution losses	4,551,629
Total accounted for	26,896,904
Total maximum supply demanded, kw.	12,159

North-Eastern Railway Co.—In their report for the past half-year the directors give the following figures relating to electric train working:—

Expenditure.	Half-year, Dec., 1908.	Half-year, Dec., 1907.	Decrease.
Electric train working	£16,377	£17,467	£1,090
Passenger trains (electric) ...	611,275	611,885	610
Goods ,, ,, ...	2,671	2,942	271
Electric car-mileage (passenger)	1,918,636	1,977,849	59,213

Stock Exchange Notices.—The Committee have appointed special settling days as under:—

Wednesday, February 17th.—North Borneo State Rubber, Ltd.—100,000 guaranted shares of £1 each, fully paid, Nos. 1 to 100,000.

And ordered the undermentioned securities to be quoted in the Official List:—

County of London Electric Supply Co., Ltd.—Further issue of 1,171 six per cent. cumulative preference shares of £10 each, fully paid, Nos. 130,998 to 132,168.

North Borneo State Rubber, Ltd.—100,000 guaranted shares of £1 each, fully paid, Nos. 1 to 100,000.

Telephone Co. of Egypt, Ltd.—Further issue of £50,000 4½ per cent. debenture stock.

Companies Registered in 1908.—In its annual summary of new companies registered during last year, the *Investors' Guardian* gives the following figures relating to English registrations:—

	1906.	1907.	1908.
Electric	4,993,312	2,200,635	1,791,025
Engineering and hardware	6,723,770	7,939,230	6,222,195
Gas	670,975	1,236,840	1,010,600
Railways and tramways	8,198,725	1,788,547	1,827,050
Rubber	4,474,950	4,927,950	2,151,482

Our contemporary remarks:—"Electric enterprise has been in a very parlous condition, and the Somerset House registrations in this group have fallen to a phenomenally small capital value—the smallest for at least 10 years."

Prospectus.—*Bukit Kajang Rubber Estates, Ltd.*—This company is to acquire estates from the Bukit Kajang Rubber Co., Ltd., a Singapore company, and 15,684 shares of £1 each are being offered at par. There will be paid as purchase money 57,816 fully paid shares, and 6,500 with 5s. paid.

City of Buenos Ayres Tramways Co. (1904), Ltd.—The directors recommend for the year ended December, 1908, a balance dividend of 1s. 3d. per share, making 5s. for the year. £3,300 is to be transferred to the general amortisation fund, and £148 is carried forward.

Yorkshire Electric Power Co.

THE directors report that for the 12 months ending December 31st, 1908, the receipts from the sale of energy and for work charged out to consumers, &c., were £18,643, against, for the year 1907, £11,994, and for 1906, £5,999. The gross profit on the revenue account for the year is £2,819, against a gross profit of £433 for the year 1907, a loss of £2,861 for the year 1906. After payment of mortgage interest the net revenue account shows a profit on the year 1908 of £718 (1907, loss £1,350), (1906, loss £3,348). Notwithstanding the general slackness in all the industries of the district, there has been a steady and continuous growth in the business of the Power Co., which is shown in a diagram accompanying the report. At December 31st, 1908, agreements with consumers had been made for a total demand of 8,333 KW. (11,170 H.P.), an increase over that of 1907 of 2,785 KW. (3,733 equiv. H.P.), compared with an increase in 1907 over 1906 of 3,026 KW. (4,056 H.P.), and in 1906 over 1905 of 1,330 KW. (1,783 H.P.). The supply of energy for tramway purposes in Ossett and Soothill Nether was commenced in November last. The new overhead mains passing through Thornhill, Whitley Upper, Flockton, Emley, Skelmanthorpe and Clayton West, in the direction of Barnsley, have been erected, and a supply of electrical energy has just been commenced from these mains. A number of important agreements with colliery proprietors and other power users in the districts through which the mains run have been concluded and it is anticipated that a large and growing load will be secured on this route. The directors report a continuous increase in the requirements of textile factories, which class of consumer has been during the past year the most important user of the company's supply. In addition to new customers secured over the whole area, there is again the steady growth of demand from existing consumers who constantly extend the use of the company's power in their works, thus proving in the most emphatic way their appreciation of the advantages obtained. The increasing demands have necessitated the installation of an additional boiler in the space and on the foundation already provided at Thornhill. This is in course of erection and will be handed over to the company in a few weeks. In spite of the high price of coal during the past year, the increased output of current has again reduced the average cost per unit sold. Of the issue of £45,000 of second mortgages on the undertaking of the company, £33,205 have been applied for and allotted up to December 31st last.

Central London Railway Co.

THE meeting of this company was held on the 4th inst. at the Holborn Restaurant, Sir Henry Oakley presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, January 29th, p. 187) said that they had expended £8,268 on capital account, which was due to a further payment on account of the additional power plant at Shepherd's Bush. There was also included the expenditure on the construction of the loop line at Wood Lane, which did away with the shunting, and he believed that no expenditure had been more profitable. There was £150,000 shares unissued, and the capital had been overspent to the amount of £96,421. As they would remember, from time to time complaints had been made as to ventilation. During the past year the directors had been making experiments with a view to better ventilating the tunnels. They already had a ventilator at Shepherd's Bush, but during the past year they had installed another at the Museum Station. If that should prove successful they intended to adopt it at one or two other stations. In the immediate future they would have to spend some money on the replacing of the wooden platforms with concrete ones. It might be said that they could delay such work, but he thought that there was nothing more calculated to strengthen the opinion of the public in the safety of the line, than for them to know that their tunnel was safe from fire. They had already completed the alteration at one station. Technically speaking, the cost of those alterations should be made good out of revenue, but he thought it was too big a burden to place on the present proprietors, so they had decided to place the cost to capital account. Turning to the revenue account, they had a gross increase of £50,000, and the gross expenditure to earn that increase had been £5,234, which was an achievement which was very rare, certainly in their own undertaking, and he thought in other tube railways. Of that £50,000 increase, £46,000 was derived from passenger receipts and the remaining £5,000 from advertisements, &c. The number of additional passengers carried was 5,250,000 as compared with the same half-year in 1907, the total number being 21,996,000, as compared with 19,901,000 for the half-year ended June last. He thought the staff were to be congratulated on the way in which they handled the enormous traffic which occurred in connection with the Franco-British Exhibition. It was intended to have another Exhibition this year at Shepherd's Bush, and he could assure those who were responsible that the public would be carried there quickly and safely. The competition from the omnibuses, both horse and mechanical, was not only incessant, but increasing. They would be surprised to hear that from observations made, it was found that at their Lancaster Gate Station 647 motor-omnibuses and 118 horse omnibuses passed along the whole line of their route to the the City per day. Then again, at the British Museum Station 707 motor-omnibuses and 1,103 horse omnibuses passed every day. Those facts had led them to consider the question of 1d. fares. They had, however, to consider whether the bringing of the fares down to the level of their competitors would not be more costly than continuing on the present lines. They must remember that many of their passengers now paid them 2d. fares, whereas if they were to have 1d. fares in operation they would only pay a penny. Thus, the penny which was now clear profit would be lost. They would have to carry many more passengers at cost price before they were in a position to get the profit they now earned. There might be many reasons apparent to those outside the board why it would be commercially wise to reduce the fares, but he could assure the shareholders that the directors had all the details at their finger ends every day, and they were carefully considering the question. When the time came they would deal with it, but for the present he asked them to leave the matter in the directors' hands. After providing for the interest on debenture stock and other payments, there remained a balance of £118,384, and after the payment of the dividends proposed there was a balance of £60,338. It might be said that they should pay a larger dividend, but he thought they must regard the receipts from the Franco-British Exhibition in the nature of a windfall, and he considered that they should strengthen their reserves, so that when the time came for the renewal of plant or machinery, they would be able to do so without burdening the revenue. They had therefore decided to place to reserve £20,000 instead of the usual £10,000, making that item £95,083. They then had a balance of £40,000. As they all knew, nowadays a lot was said about pensions and annuities for railway staffs, and the directors thought that some provision should be made in that direction; they had therefore decided to carry that £40,000 forward. With reference to the Bill which had been deposited in Parliament, they proposed to extend their line from the Bank to Liverpool Street. That was originally part of the company's scheme, but the directors at that time did not think it expedient to go on with it. Now, however, they thought differently. There was an enormous traffic coming to the Great Eastern Station at Liverpool Street, and to the North London at Broad Street alongside, and they were convinced that there was a good field for development. The Great Eastern were giving them the land without charge, and the station of the Central Co.'s line would be constructed under the Liverpool Street Station and give access to and from Broad Street. They had gone very carefully into the question both from a commercial and physical point of view. It had been proved that 91,991,000 people passed in and out of Liverpool Street Station every year. The London County Council had taken observations to find out where the people arriving at the station dispersed to. Between the hours of 6 and 10 in the morning, it was found that 80,000 persons passed out of the station every day. Of that number, 40,000 went Shoreditch way, 25,000 along Blomfield Street to the West, 950 down Houndsditch, and the rest passed along Bishopsgate. At Broad Street, 26,995,000 passengers arrived every year, so that to the total coming to Liverpool Street, a considerable number had to be added. At the Central Co.'s station at the Bank, 20,000 passengers departed and arrived every day. If they had an interchange of 15,000 to 20,000 more passengers each day from the two lines, they would have a return on the capital outlay of 5 per cent. He thought, therefore, the expenditure would be justified, and they had to remember that they had not taken into account through bookings. They now booked four million through passengers, and two years ago they had not got one of them. In fact, the proportion of through bookings was 18 per cent. of the takings. Another provision in the Bill was for the construction of a subway at the Museum Station to connect the line with the Piccadilly Railway at their Holborn Station. They were also going to construct a subway at the Bank to connect up the City and South London line. There might be a little difficulty in constructing the subway at the Museum Station, as the Piccadilly tunnel was 50 to 70 ft. below the level of theirs. He thought, however, they could leave the matter in the hands of the directors.

VISCOUNT ST. ALDWYN seconded the motion.

MR. LEVY thought that, with reference to the proposed construction of the line to Liverpool Street, that the Great Eastern and the North London Railways should pay towards the cost as well as their own company.

Several other shareholders joined in the discussion, in which marked differences of opinion were expressed as to the advisability of the introduction of 1d. fares.

Ultimately the report was adopted.

An extraordinary meeting was subsequently held, when a resolution was agreed to authorising the directors to proceed with their Bill in the forthcoming session of Parliament.

St. James' and Pall Mall Electric Light Co., Ltd.

IN their report for 1908 the directors state that the supply has been distributed from the Carnaby Street and Mason's Yard Works of this company on a demand of 11,729 KW., being an increase of 803 KW. For this purpose 4,968,280 units were generated at these works, and 6,370,250 units were purchased from the Central Electric Supply Co., Ltd. The Central Electric Supply Co., Ltd., has declared a dividend of 5 per cent. on the ordinary shares, in respect of which a sum of £2,500 will in due course be payable to this company. The Bill to confer further powers upon this company in conjunction with the Westminster Electric Supply Corporation, Ltd., the Central Electric Supply Co., Ltd., the Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., with respect to the supply of electrical energy and for other purposes, received the Royal Assent on December 21st last. The directors have raised the contingency fund to the sum of £5,000 by transferring from the net revenue of the past year an amount of £3,500. The net profits for the year 1908, applicable to dividends on shares, amount to £29,330, plus

balance brought forward from 1907, £1,375, less interim dividend paid in August last for half-year ending June 30th, at the rate of 7 per cent. on preference shares (£3,500) and 10 per cent. on ordinary shares (£10,000) = £13,500, leaving an amount of £17,205 to be dealt with. The directors propose to pay a dividend at the rate of 7 per cent. on the preference shares for the second half-year, £3,500, also a dividend on the ordinary shares for the second half-year of 5s. per share, making, with the interim dividend paid in August last, a total distribution of 10 per cent. for the year, £10,000, carrying forward £3,705. In March last Col. Eustace Balfour retired from the chair, and Mr. Walter Leaf was chosen for that position. The following is a statement of electricity generated, sold, &c., for the year ending December 31st, 1908:—

B. of T. units generated	4,868,280
,, purchased	6,370,250
Quantity utilised—Private supply	9,336,979
Public lighting	190,253
Used on works	194,868
Total	9,722,150
Quantity expended in distribution	1,616,480
Kw. installed December 31st, 1908	11,729

Bristol Tramways and Carriage Co., Ltd.

The report of the directors submitted to the meeting held on Wednesday, states that during the year ending December 31st, 1908, the gross receipts amounted to £265,362, and the working and general expenses to £190,582 leaving a net revenue of £74,780, as compared with £85,347 in the preceding year. The difference is due to the fact that, as indicated at the last general meeting, the directors have charged against revenue, instead of against reserve, the expenditure upon reconstruction of permanent way, which amounted during the year to £9,877 in addition to the outlay of £11,664 for ordinary repairs and maintenance usually borne by the revenue.

From the net revenue the following amounts have already been distributed, viz.:—

Interest for the year on 4 per cent. mortgage debenture stock, 4½ per cent. mortgage debenture stock and on deposits and bankers' interest	£18,830	
Dividend on 4 per cent. preference shares for the year (subject to income-tax)	19,000	
Interim dividend at the rate of 6 per cent. per annum (subject to income-tax), for the half-year ending June 30th	14,250	
		£52,080
And it is proposed to appropriate the balance as follows:—		
Final dividend for half-year at the rate of 6 per cent. per annum (subject to income-tax)	14,250	
Addition to reserve fund for contingencies and renewals	8,450	
		22,700
		£74,780

The company's investments at December 31st last, taking at market value, amounted to £196,543 corresponding with the amount of the reserve fund as appearing in the balance-sheet. The interest on investments has been carried direct to the credit of that fund, and with the addition now proposed of £8,450, the reserve fund will be further augmented to £204,993. The total number of passengers carried during the year on the company's cars and omnibuses was 46,652,389, as compared with 46,585,050 in the previous year, an increase of 67,339. The directors have recently added to the equipment of the carriage department a considerable number of motor cabs, which have been received with much favour by the Bristol public. The extension of the tramways to Westbury-on-Trym was constructed during last summer, and opened for public traffic as far as Henleaze early in September, and throughout to the centre of Westbury on October 22nd. The Bill promoted last Session to extend the time for the construction of the remaining authorised extensions received the Royal Assent on August 1st.

Imperial Tramways Co., Ltd.

The directors' report to December 31st last gives the following results:—

Middlesbrough, Stockton and Thornaby Electric Tramways.—The gross receipts from this undertaking amounted to £60,905, as compared with £54,747 for the previous year—a decrease of £3,842. The number of passengers carried was £10,014,056, against 10,700,643 last year—a decrease of 686,587. After placing £1,100 to the reserve fund for renewals (bringing the total of that fund up to £17,000), the net profit for the year is £16,872, as compared with £16,884 for the corresponding period. The falling off in the traffic receipts for the year is wholly attributable to the unsettled trade conditions and lack of employment in the engineering and shipbuilding trades of the district served by the company's system.

London United Tramways, Ltd.—The Imperial Co.'s investment in this undertaking has not been varied during the year, and remains at 44,446 5 per cent. cumulative preference fully-paid shares of £10 each. The full dividend of 5 per cent. per annum was received on these shares for the first half of the year, but for the second half-year only 2½ per cent. per annum was paid on account. The directors of the London United Co. state that, although the revenue account for the year will doubtless show a balance sufficient to cover the full dividend on the preference shares, they have adopted the policy of reducing the preference dividend for the present, with a view to strengthening the reserve funds. The directors were much disappointed to receive an intimation of this nature, having regarded the Imperial Co.'s income from the investment in London United Tramways preference shares as a fully assured one, and they yet trust the developments in connection with the London United undertaking will enable the directors of that company to make up the arrears and resume payment of the full rate of 5 per cent. on the cumulative preference shares at no distant date.

The effect of the non-receipt of the full rate of dividend from the London United Tramways investment is that the Imperial Co.'s revenue account is depleted by the sum of £5,278, representing between 5 and 6 per cent. per annum for the half-year on the Imperial ordinary capital. In the result, therefore, the net revenue account for the year shows an available balance of £35,943 only, and after payment of interest on the debenture stock for the whole year, and interim dividends on the preference and ordinary shares in respect of the half-year to June 30th last, amounting together to £26,125, it is proposed to appropriate the balance as follows: Dividend at 6 per cent. per annum on the preference capital (paid on January 1st last) £5,700, final dividend at 4 per cent. per annum (making 6 per cent. for the year) on the ordinary capital (less income-tax), £3,800, and to carry forward to the next account £318. It will be seen that the amount transferred from the ordinary shares dividend fund is £3,250, as compared with £3,750 in the preceding year.

British Aluminium Co., Ltd.

An extraordinary general meeting of this company was held on Friday last at Winchester House, Old Broad Street, Mr. J. D. Bonner presiding.

The Chairman formally proposed the following resolution:—

(A) That each of the £10 1908 conversion shares (created in 1907) in the company's capital be divided into two shares of £5 each, one of which shares shall be a 7 per cent. preference share entitling the holder thereof to participate in the profits of the company as from January 1st, 1909, and ranking in all other respects *pari passu* with the existing 7 per cent. preference shares of the company, and the other shall be an ordinary share entitling the holder thereof to participate in the profits as from the same date and ranking in all other respects *pari passu* with the existing ordinary shares of the company. (B) That the shares resulting from the division of each of the existing £10 1908 conversion shares be renumbered consecutively with the existing 7 per cent. preference shares and ordinary shares respectively. (C) That as regards such of the £10 1908 conversion shares as are not fully paid up, the proportion between the amount which is paid and the amount which is unpaid on each share of reduced amount shall be the same as it was in the case of the existing share of £10 from which the shares of reduced amount are derived.

He remarked that the third clause related to one-third of the capital.

Mr. H. Wolfenden seconded the motion.

Mr. Kirwan asked whether the chairman could give them any further information.

The Chairman replied that there was very little which he could say which would not be prejudicial at the present juncture of the company, so he preferred not to make a speech. He might, however, say that the aluminium works would soon be in operation. They would remember that when he last addressed them two years ago on the question of the creation of the 1908 shares, he told them that he believed that owing to the great amount of power which was then being developed, the aluminium would very likely be over-produced. That opinion had since proved to be well founded. The aluminium pool was broken up, and the metal was selling now in round figures at about £60 per ton.

The resolution was carried.

Great Northern and City Railway Co.

The Earl of Lauderdale (chairman) presided on Friday at the Westminster Palace Hotel, W., over the twenty-first half-yearly meeting of the above company.

In moving the adoption of the report (see Electrical Review, February 5th, page 226), the Chairman said that on capital account there was an expenditure of £520 10s. The gross receipts, as compared with the same period of 1907, had fallen by £8,755; whilst the loss from passenger traffic was no less than £8,801; on the other hand, the gross expenditure had been reduced by £2,965, owing to more stringent economy under various headings. The revenue account showed that £17,013 was carried to net revenue account, as against £22,804 last year. In the net revenue account, they would find a credit of £5,596 entered as a "special receipt," to which he would refer later. This credit enabled them to exactly balance the accounts for the half-year. The balance remaining to the credit of the renewal fund was £598. There had been a considerable decrease in car-miles, due to the paucity of passengers required to be carried. The train-miles showed a slight decrease consequent on a readjustment of the train service during the non-busy hours caused by the heavy falling off in the mid-day shopping and pleasure traffic. The working expenses, although in the gross there was the reduction of £2,965, yet the percentage amounted to 56·18, which was above that of the corresponding half-year of 1907 by 4·11, owing, as was quite evident, to the heavy loss in the traffic receipts. The total number of passengers carried was 5,533,697, or a decrease of 2,009,477, as compared with the same period of 1907. It might be thought by some that the alterations they made in the fares in November, 1907, when the electric trams began to affect them, had influenced their losses adversely, but this was not the case, for they had really mitigated them. He had taken all the distances where the fares had been raised, against all those where they had not, and found that whilst in the unaltered fares they had lost 32 per cent., both in passengers and revenue (he was comparing with 1906 when the electric trams were not in

operation), in the altered fares their loss in passengers was 28 per cent., and in revenue only 17 per cent., a difference as compared with the unaltered fares, of 4 per cent. less loss in passengers, and 15 per cent. less loss in revenue, or to put it in another way they had lost between one-fifth and one-sixth of their revenue in the altered distances, as against one-third in the unaltered. They were, therefore, quite satisfied that the alteration in fares had helped them to reduce the loss. In the position of embarrassment in which the company found itself, it was, of course, out of the question to attempt the extension to the Bank, for which they held Parliamentary powers. They could not, if they would, place their unissued capital as prior securities to enable them to carry out the improvement. If it were possible to do so they might get beyond the sphere of tramway interference, and, by landing their passengers at the Bank, might induce a large number of them to return. They had accelerated all their trains during the morning hours, and they now accomplished the journey from Finsbury Park to Moorgate in 11½ minutes, and if they could they would provide a large number of non-stop trains. Unfortunately it was impossible to provide passing places for these on the system, as they had neither the space, the means, nor the Parliamentary powers, to authorise them. The cost of working, though very low, was still somewhat affected by the fact that they were hampered by the non-fulfilment of their original scheme. Their tubes and rolling stock were of standard size so as to admit of use by, and interchange with, the Great Northern Railway stock. Whatever the future might have in store for them, the size of the tubes was to-day an element of additional cost rather than of additional advantage. The result of the figures which he had submitted was, of course, a most disastrous one, but it was only what he foreshadowed in his speech last August. It was not to be expected that any other result should have been attained than a bad one, but their troubles had been accentuated by the mild weather. With the exception of a beneficent blizzard, which accompanied the closing days of the year, and which brought a welcome addition to the passengers, as did also last week's fog, there had been no climatic cause to specially induce them to use the line. The chairman then referred to the factors which more especially influenced the short-distance passenger in selecting the mode of transit. Their fares from Highbury to Old Street were the same as on the trams, nevertheless in this short-distance traffic, compared with 1906, when they were not influenced by the electric trams as they were not in operation, they had lost 32 per cent. both in passengers and in revenue, whereas between Finsbury Park and Moorgate, which was the longest distance on the line, and where the local fares had been raised and were, single journey 2½d., and return 4½d., against trams, 2d. and 3d. respectively, though they had lost 37 per cent. in passengers, the loss in revenue was but 25 per cent., *i.e.*, 7 per cent. less than on the short distance. Again, taking the whole of the long-distance traffic, *i.e.*, the fares at 2d. and over, against the whole of the short-distance traffic, *i.e.*, the fares at 1½d. and 1d., they had lost 13 per cent. more in revenue in the latter, or short-distance traffic, than on the former or long distance. This clearly indicated the greater severity of the competition on the short than on the long-distance traffic, notwithstanding that there had been but little alteration in the short-distance fares. Their losses were mainly due to the exceedingly low fares on the L.C.C. trams. Were it not for this they would no doubt compete much more successfully. Their fares were for the time being more or less governed by the terms of the agreement with the G.N.R., but they had taken steps which would give them more freedom of action in this matter. So long as the ratepayers of London chose to permit the continuance of a tramway service on the basis of these low fares, they were completely powerless. They could only complain that they were rated to their detriment to assist to maintain these trams, and as the figures of the traffic themselves showed, the loss in passengers which they had sustained was, and could mainly only be, due to tramway competition. As regarded passengers they were to-day in a worse position than they were in the December half of 1904, the year in which the line was first opened. "He that is down need fear no fall." They were fain to hope that they had nearly touched bottom and now knew the worst. They had got to begin over again, and to work back slowly and gradually to the position they had attained prior to the establishment of the electric tramway. Fortunately, there were no bounds to be placed on the possibilities of London traffic, and the growth of movement in London must almost of necessity enable them in time to recover their position. They could hardly say that they were being assisted in this matter by the Great Northern Railway. He mentioned at the last meeting that several of the Great Northern trains which used to stop at Finsbury Park station now ran through. Owing to this they had lost a considerable number of interchange passengers, and thus their misfortunes had been added to by this policy of the Great Northern Railway, and also by the fact that they had accelerated their service to King's Cross. They had done, and were doing, everything that they could think of to attract passengers to the line, by through bookings with other lines, and by the acceleration of the busy time train service. They had also introduced a new system of eight-day short-distance tickets available for any day in the week, for 12 journeys at a reduced price. These tickets were growing in popularity, and were certainly regaining for them some of their former passengers. They were reluctant to contemplate a further reduction in fares. They were already quite low enough, and the board certainly doubted whether they could prudently reduce them; but whilst they were running a frequent and regular service of trains, they must have passengers to fill their coaches, and if they were forced to continue to face the competition of the tramways at low fares, and in the absence of assistance from the Great Northern Railway, it might well be that they might have to consider a drastic cutting down of fares. At the present moment they were working at a loss, and there was a minimum below which they could not reduce their expenses. They had their fixed charges to consider; they had failed to meet them this half-year, and it was doubtful whether they would be able to do so in the present year. The situation was, therefore, acute, and it might be necessary to deal with it in a drastic manner. Turning now to the one pleasant feature of the accounts, they would see that the situation had been saved and a balance of the accounts achieved by the receipt of £5,596 under the heading "special receipts." This money had been paid to the company, as a gift, by a group of gentlemen, interested both as shareholders and otherwise in this little line, who were determined that it should not be wrecked through the unfair competition to which it was at present subject, without at least having a fair chance of life. The company might congratulate itself upon its friends who had stood it in such good stead in the present instance. The directors felt reasonably confident, that if this railway showed signs of recovery, it would not be allowed to founder for the want of kindly assistance.

Mr. C. Steel seconded the motion.

Mr. Bell said that the Great Northern Railway could not go further than Moorgate Street and the tramways could not get into the City, and he was convinced that the prosperity of their company was to a large extent dependent on their getting to the Bank. He therefore hoped that there would be some way of raising the necessary money to enable this extension to be made.

Mr. A. E. Franklin endorsed the views of the previous speaker as an original subscriber of £10,000 to the company. They had to face the fact that it was the tramway competition which was so adversely affecting them, and their only hope appeared to be to give something to the public which their competitors could not give. He also suggested that the board might consult with the largest shareholders to see if there was any chance of raising money for the Bank extension. The board had the sympathy of the shareholders, but obviously suggestions which might be made in private could not be touched on at a public meeting.

Mr. H. Ansell also spoke in favour of the Bank extension, and pointed out that the debenture-holders might, under the present condition of things, allow of a prior charge.

The Chairman said it was the great desire of the board to get to the Bank, but it was all a question of £ s. d. The board would welcome the assistance of some of the large shareholders to discuss the matter.

The report was then adopted.

Central Electric Supply Co., Ltd.

The directors' report for 1908 states that energy has been supplied to the St. James' and Pall Mall Electric Light Co., Ltd., and the Westminster Electric Supply Corporation, Ltd., throughout the year, to an amount of 18,859,180 units. After making a full allowance for sinking fund and depreciation the net balance for the year 1908 is £4,981; add balance brought forward from 1907, £43, leaving to be dealt with £5,024. The directors propose to pay a dividend at the rate of 5 per cent. on the ordinary shares for the year, requiring £5,000, and to carry forward £24.

The Bill to confer further powers upon this company in conjunction with the Westminster Electric Supply Corporation, Ltd., the St. James' and Pall Mall Electric Light Co., Ltd., the Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., with respect to the supply of electrical energy and for other purposes, received the Royal Assent on December 21st last. Sir John H. Morris, K.C.S.I., has been appointed a director of the company in place of Col. Balfour, who retired from the board.

Canadian Issue.—The New York and Ontario Power Co. has been authorised to issue $1,850,000 30-year 5 per cent. gold bonds. The company is developing a water-power on the St. Laurence River, at Waddington, on the American side. The company expects to develop 30,000 H.P. 24-hour service, every day in the year, at a comparatively low cost.

Mather & Platt, Ltd.—The directors announce a 10 per cent. dividend on the ordinary shares for 1908, together with a 7½ per cent. bonus. Last year the dividend was 10 per cent. plus 5 per cent. bonus.

South London Electric Supply Corporation, Ltd.—A dividend on the ordinary shares for the year 1908 at the rate of 5 per cent. per annum is recommended. Last year 4 per cent. was paid.

Western Union Telegraph Co.—The *Journal of the Telegraph* states that the accounts to December 31st last, after paying dividends and bond interest, show a surplus of $16,148,044, the amount brought forward from last quarter being $15,327,928, so that the profit for the quarter October 1st to December 31st last was $820,116.

Tyneside Tramways & Tramroads Co.—The directors' report for the half-year ended December, 1908, recommends a dividend of 1½ per cent. per annum, as compared with 2½ per cent. for the corresponding period of last year. The meeting was held at Newcastle on Tuesday.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 3	2,287	+ 19	36	50,245	— 75	..	..
Ayr	„ 6	354	— 11	38	11,568	— 242	..	..
Bath	„ 3	1,097	— 18	5	3,008	+ 237	..	..
Belfast	„ 5	7,113	+ 368	45	163,911	+ 540	..	..
Birkenhead	„ 7	2,009	— 7	45	47,823	+ 595	18·52	..
Birmingham Corp.	Jan. 30	12,211	— 203	44	280,111	+ 7,610	..	..
Blackpool-Fleetw'd	Feb. 6	446	+ 68	5	1,226	+ 160	..	..
Bolton	„ 7	4,099	— 46	45	103,290	+ 1,553	26	..
Bournemouth	„ 3	2,360	— 136	44	71,982	— 3,289	21·96	..
†Bradford	Jan. 30	4,060	— 36	43	203,345	+ 734	54·9	..
Brighton	Feb. 7	1,358	+ 58	44	40,855	+ 1,011	9·5	..
Bristol	„ 5	8,992	— 15	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	Jan. 29	397	— 35	4	898	+ 16	3·65	..
Barnsley	„ 29	309	— 3	„	648	— 18	..	..
Barrow	„ 29	384	— 30	„	793	— 51	5·37	..
Cavehill	„ 29	100	— 7	„	212	— 7	..	..
Devonport	„ 29	710	— 106	„	1,765	+ 93	8·85	..
Gateshead	„ 29	1,861	— 48	„	3,923	— 2	11·25	..
Gravesend	„ 29	325	— 29	„	712	— 30	6·5	..
Greenock	„ 29	823	— 60	„	1,737	— 42	7·25	..
Hartlepool	„ 29	370	— 73	„	814	— 104	6·72	..
Kidderminster	„ 29	148	— 14	„	321	— 9	..	..
Leamington	„ 29	263	+ 12	„	580	+ 75	3	..
Merthyr	„ 29	378	+ 1	„	803	+ 36	2·9	..
Metropolitan	„ 29	10,068	+1,142	„	21,667	+ 3,275	22	..
Middleton	„ 29	527	— 8	„	1,134	+ 10	8·5	..
Mid. Joint Com'tee	„ 29	10,227	— 520	„	20,834	— 337	..	..
Oldham—Ashton	„ 29	968	— 62	„	2,069	— 94	9·13	..
Peterborough	„ 29	172	— 21	„	375	— 29	5·31	..
Potteries	„ 29	3,329	— 307	„	7,019	— 464	29	..
Rothesay	„ 29	69	— 14	„	190	+ 14	2·75	..
Southport	„ 29	417	+ 46	„	906	+ 136	8·17	..
S. Metropolitan	„ 29	1,235	+ 88	„	2,786	+ 215	..	..
Swansea	„ 29	1,650	+ 62	„	3,498	+ 256	12·5	..
Tynemouth	„ 29	268	— 35	„	542	— 60	3·75	..
Weston-s-Mare	„ 29	67	+ 5	„	113	+ 12	3	..
‡Worcester	„ 29	415	— 25	„	960	+ 41	5·75	..
Wrexham	„ 29	172	— 5	„	363	+ 18	..	..
Yorks. Wool. Dist.	„ 29	1,570	— 94	„	3,390	+ 3	17	..
Miscellaneous	„ 29	335	— 16	„	721	— 14	..	..
Burnley	Feb. 6	2,193	— 77	..	..	..	..	..
Burton-on-Trent	„ 7	442	— 49	45	12,015	— 640	10	..
Bury	„ 7	1,973	— 14	44⅔	51,463	+ 1,691	22·5	..
†Cardiff	„ 6	3,794	+ 16	45	96,361	+ 429	..	..
†Carlisle	„ 2	154	— 1	52	9,210	— 34	..	..
Chatham and Dist.	„ 4	1,298	+ 98	5	3,541	+ 442	..	..
Cork	„ 4	824	+ 42	5	2,107	+ 98	9·9	..
Croydon	„ 3	2,319	+ 5	44	61,451	— 267	11·25	·75
†Darlington	Jan. 30	165	— 22	44	8,590	— 699	..	..
Darwen	Feb. 5	424	— 27	44	11,067	— 314	4·96	..
Dover	Jan. 30	275	— 8	44	9,395	— 420	4·75	..
Dublin	Feb. 5	9,459	+ 220	..	25,100	+ 1,002	54·25	5·5
Dundee	„ 3	2,228	+ 78	37⅔	45,426	+ 1,948	14·5	..
East Ham	„ 6	1,641	+ 29	45	39,639	— 719	8·43	·68
†Exeter	Jan. 29	217	— 15	44	13,760	+ 368	5·5	..
Glasgow	Feb. 6	32,854	— 85	..	614,011	—10,162	90·5	1·5
Hastings	„ 4	1,308	..	..	..	..	..	..
Huddersfield	„ 6	2,832	+ 5	45	70,870	— 365	23·5	·5
Hull	„ 3	4,758	— 84	45	110,814	— 423	18	..
Ilkeston	„ 6	222	— 18	44	6,114	— 97	3·5	..
Ipswich	„ 6	564	— 17	45	17,403	— 290	10·5	..
Kilmarnock	Jan. 30	277	— 1	37	5,667	— 254	4·26	..
Lan'kshire Trm. Co.	Feb. 4	2,337	+ 17	5	6,298	— 384	17	1·18
Lancashire United	„ 3	2,185	+ 17	5	5,677	+ 306	39	1
Leeds	Jan. 30	11,689	— 34	41	287,854	+ 3,602	96·50	·25
Leicester	Feb. 6	3,924	— 86	..	..	..	..	..
Leith	Jan. 30	921	+ 23	37	19,690	+ 58	6	..
Liverpool	„ 30	19,984	— 10	4	44,923	+ 1,785	104	..
‡L.C.C.	„ 30	63,281	+5,241	..	1,526,678	+168,437	121	4·25
London United	Feb. 6	9,160	—1,251	..	26,035	— 366	..	..
Lowestoft	„ 6	225	— 49	19	2,839	— 238	3·5	..
Manchester	„ 6	27,235	— 154	45	673,365	+17,062	90·5	6
Newcastle	„ 6	7,989	— 327	45	175,122	— 8,460	..	..
Newport	„ 6	1,102	— 2	45	29,253	— 1,104	14·5	..
Oldham	„ 7	3,522	— 122	45	87,815	— 449	23·75	..
Pontypridd	Jan. 30	709	+ 114	44	16,747	+ 4,673	5·5	1·75
†Portsmouth	„ 30	1,431	+ 18	44	36,808	+ 1,302	14·5	..
Preston	Feb. 3	1,268	— 33	..	..	..	..	..
†Reading	Jan. 14	1,170	+ 104	41	25,993	+ 11	13·25	..
Rotherham	Feb. 4	1,085	— 69	44	27,079	— 50	10	·66
Salford	„ 1	7,941	— 305	44	202,961	+ 148	41	..
Sheffield	„ 7	10,423	— 201	45⅓	252,361	— 3,540	57	1·25
Southampton	„ 3	1,788	— 35	44	47,185	+ 1,782	..	..
Southend-on-Sea	„ 3	525	+ 44	45	19,696	+ 1,957	..	..
South Shields	„ 6	970	+ 13	..	25,045	— 277	..	..
†Swindon	Jan. 27	103	— 26	..	..	..	4·4	..
Tyneside	Feb. 3	724	+ 8	5	1,810	— 22	8·87	..
Wallasey	Jan. 30	1,480	+ 92	43½	38,861	+ 2,229	3·72	·22
Walthamstow	Feb. 6	958	+ 4	45	28,098	+ 1,487	9	..
West Ham	Jan. 28	3,954	— 58	44	97,000	— 4,207	15	·3
Wolverhampton	Feb. 3	1,366	— 177	44	36,607	— 1,058	12·5	..
Baker St.-Waterloo	Feb. 6	6,965	+ 745	5	17,280	+ 1,660	4·25	1
Cen. London Rly.	„ 6	11,461	— 841	5	28,498	— 2,698	6·29	·56
Char. +, Eus. Hamp.	„ 6	7,660	+1,345	5	19,255	+ 3,490	6	..
City & S. Lon. Rly.	„ 7	7,030	+ 340	5	17,179	..	7·5	1·05
Dublin-Lucan Rly.	„ 5	219	+ 36	5	549	+ 64	7	..
G.N. and City Rly.	„ 6	3,561	— 416	5	8,029	— 1,226	3·5	..
G.N., P'dy. & Brmin.	„ 6	11,920	+ 949	5	29,650	+ 2,395	9·25	·25
‡L'pool Overh'd Rly.	„ 7	2,688	— 140	5	6,906	— 170	6·6	4·6
Mersey Railway	„ 6	3,917	+ 174	5	9,891	+ 404	4·5	..
Metropolitan Rly.	„ 7	31,493	+1,004	5	80,233	+ 2,733	24·5	..
Met. District Rly.	„ 6	19,507	+1,345	5	49,331	+ 4,154	24	..
Anglo-Argentine	„ 4	50,795	+15,947	5	130,154	+41,435	43	..
†Bombay (B.E.T.)	Jan. 7	2,611§	+ 207	..	..	..	..	..
§Brisbane	Jan.	15,860	+1,020	..	..	..	..	..
Calcutta	Feb. 6	6,695	+ 992	..	..	..	..	..
§Kalgoorlie, W.A.	Jan.	3,720	..	..	..	..	20·5	..
Madras	„ 31	1,400	+ 69	4	9,839	+ 196	12·75	..
Perth (W.A.)	Feb. 5	3,059	+ 144	5	7,935	+ 175	25·6	..

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Prospects in the Money Market are considered to favour the idea of cash becoming cheaper in the near future. Therefore Consols and several of the best new issues in their department have risen appreciably, affecting most of the other investment sections. Business is somewhat erratic, but investors are making their presence felt all round the Stock Exchange.

Of the new issues in the electricity world, Anglo-Argentine Tramways new Debenture, after dipping to 2⅜ discount, rallied 1½, and the new Mexico Tramways 6 per cents. are 1½ discount, after being lower. The underwriters had to take about 75 per cent. in the case of the Anglo-Argentine Tramways stock, and 83 per cent. of the Mexico Tramways bonds.

Electricity Supply shares are a steady market, the dividends on the Metropolitan Companies' shares not influencing prices to any quotable extent. The City Company's declaration, making the usual 6 per cent. for the year, made the Ordinary shares a shade easier. St. James' remained at their lowered level of 8⅝, the dividend being kept at 10 per cent. The profits show a fair increase upon those for 1907. The South London Electric has declared a dividend of 5 per cent. London Electric Ordinary are ⅛ better. The South Metropolitan's recent issue had to be liberally shouldered by underwriters.

Hove Electrics at ⅛ better, but Newcastle-on-Tyne shares continue to dwindle. The selling seems to come mostly from the country. Some of the Debenture stocks are better.

The Canadian group is very animated, especially as regards the Mexican issues. Prices are better to the tune of ½ to 3 points. Rio Trams attract a good deal of attention, having risen at last to par, and the bonds are 92¾. Sao Paulo Trams hardened to 164½. Mexico Trams are none the worse for the equivocal success achieved by the issue of the 6 per cent. bonds. The coming meeting at Toronto has now lost most of its interest, but it would be surprising were the speculators to miss the opportunity which it still presents for manœuvering the prices of Mexico Trams and Mexican Lights. Canadian General Common shares recovered to 114½ after being easier, and the 7 per cent. Preference stock is 116.

Many of the stocks of the steam railway companies are better on the week, but no miracle or volcano has occurred to raise the prices of electrical railway securities. The only share in this department to give evidence of strength is Great Northern, Piccadilly and Brompton, the price of the Ordinary gaining nearly 10s., to £8⅜. The 4 per cent. Debenture stock firmed up to 92. Baker Street and Waterloo Debenture changed hands on Monday at 95¼.

Central Londons remain depressed. The market does not greatly relish the idea of a yet further rearrangement of the fares such as the Board hint at in the report. City and South London steadily declines, and the older Undergrounds have reacted, Districts losing ¼ and Metropolitan ½.

Further support caused London United Tramways Debenture stock to gain a point, but British Electric Preference eased off to 3⅝, a fall of half-a-crown. Anglo-Argentine Trams are a quiet market, both classes of Preference shares suffering slightly in consequence of the poor response of the public to the company's invitation to apply for the new Debenture stock. British Columbia Electric Railways varieties are a little irregular, but the alterations possess no significance.

Telegraph descriptions are principally noticeable for the gain of another 1s. 3d. in Marconi shares, which has raised the price to 16s. 3d. This means that the shares are 50 per cent. higher than they stood a fortnight ago, prior to the news of how the system saved so many lives on the ss. *Republic*. The American division is better, Anglo Preferred gaining 2, and the Deferred at 13¾ being the fraction higher, after touching 13⅞. Amazon Telegraphs are ¼ up, American Telephone and Telegraph capital stock is 2 points better. National Telephones are unchanged. Telegraph Constructions eased off, but the manufacturing division, as a whole, is steady and without noticeable feature.

Rubber shares are developing more activity, but prices swing erratically, as the market is very easily moved. The statement in some of the papers to the effect that the market in rubber shares has shifted from the Stock Exchange to Mincing Lane makes up in inspiration what it lacks in veracity.

Belgium.—La Compagnie d'Electricité et de Mecanique is the name of a new company which has just been formed in Brussels with a capital of £2,000.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 2nd.	Closing Quotations Feb. 9th.	Business done week ended Feb. 9th, 1909. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅜ — 3⅛	2⅜ — 3⅛	..	..	+ ⅛	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 3 1
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	..	128 —131	130 —133	131½	131	+2	6 0 4
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	94 — 96	95 — 97	..	..	+1	4 2 6
598,180	Anglo-American Telegraph	Stock	3½%	5⅞%	3½%	£3 4s.	54 — 57	55 — 58	..	..	+1	5 5 8
8,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	97 — 99	99 —101	100	98½	+2	5 18 10
8,200,910	Do. do. do. Deferred	Stock	½%	12½	1 %	8/-	12⅞— 13⅛	13⅛— 13⅞	13 3/8	12 1/8	+ ⅜	2 17 9
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅜	7⅞ — 8⅜	..	..	..	4 15 6
2,431,360	Commercial Cable Sting. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	85 — 87	84½ — 86½	85½	84⅛	— ½	4 12 6
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7½ — 8½	7½ — 8½	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 14 3
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	..	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	8 16 6
60,710	Direct United States Cable	20	4½%	4⅝%	4½%	4½%	12 — 12½	12 — 12½	12⅜	12	..	6 16 0
58,700	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99½ —101½	99½ —101½	99⅛	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	126 —129	126 —129	127½	126½	..	5 8 6
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	..	84 — 87	84½ — 86½	86	85	+ ½	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½ —105½	103½ —105½	104½	103⅞	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	11½ — 12½	11⅝ — 12½	12⅛	11 1/8	..	5 14 3
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	99½ —101½ xd	99½ —101½	101	100½	..	3 18 10
200,000	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½ —102½	100½ —102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅝%	5⅝%	5⅞%	..	10 — 10⅛	10 — 10⅛	10⅜	10 1/8	..	5 14 8
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	..	12⅜ — 12⅝	12⅜ — 12⅝	13½	12⅜	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	..	..	..	6 5 0
24,300	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99½ —101½	99½ —101½	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	52 — 55	52 — 55	..	..	..	6 16 4
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	71 — 74	..	..	..	5 12 8
394,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	1/16 — 1/8	3/16 — 1/4	17/6	15/6	+ 1/16	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	3/32 — 1/8	1/8 — 3/16	..	..	..	6 0 9
86,492	Do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	5/32 — 3/16	3/16 — 7/32	..	..	..	5 3 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 — 111	110½	108½	..	5 7 7
2,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	120½ —122½	120½ —122½	121¾	120½	..	4 18 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝ — 5 13/16	5⅝ — 5 13/16	5 11/16	5 9/16	..	4 5 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	97 — 99	97 — 99	97⅞	97	..	3 10 11
1,716,698	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½ —101½	99½ —101½	100⅜	99½	..	3 18 10
173,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1 5/32 — 1 5/32	1 5/32 — 1 5/32	..	..	..	5 16 1
50,000	Do. do. do. 6 % Cum. Pref.... ..	1	6 %	6 %	6 %	..	1⅛ — 1¼	1⅛ — 1¼	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	89½	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7 — 8	7 — 8	7	..	..	5 0 0
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	100½	99⅜	..	4 9 1
3,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	127⅛	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅜ — 7	6⅜ — 7	6⅞	..	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅜ — 5⅜	4⅜ — 5⅜	5 1/16	5⅛	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	2½%	2½%	..	1 3/16 — 1 5/16	1 3/16 — 1 5/16	34/1½	31/10½	+ 1/16	4 2 6
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99½ —101½	99½ —101½	..	..	..	3 18 10
207,930	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	12⅝ — 13⅛	12⅝ — 13⅛	13⅛	12⅝	..	5 5 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	35/— 38/—	35/— 38/—	..	..	..	Nil
84,563	Do. do. 6 % Cum. 1st Pref.	10	6 %	8 %	6 %	6 %	7⅝ — 8⅛	7⅝ — 8⅛	8⅛	..	..	7 7 8
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7⅛ — 8⅛	7⅛ — 8⅛	..	..	..	2 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	..	8 13/16 — 9 1/16	8 13/16 — 9 1/16	9 1/16	8⅞	..	4 19 2
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅜%	5⅜%	5⅝%	..	6 — 6¼	5⅜ — 6⅛	6	5⅞	— 3/16	4 15 3
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	137 —142	137 —142	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	102⅜	..	..	4 17 1
880,000	Babcock & Wilcox, 1 to 880,000..	1	20 %	20 %	20 %	..	3 13/16 — 4 1/16	4 1/16 — 4 3/16	84/-	80/-	+ 1/8	4 15 10
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	b 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2	1⅞ — 2	..	..	..	17 10 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅛ — 3⅜	3⅛ — 3⅜	..	..	..	8 12 5
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3⅞ — 4¼	3⅞ — 4¼	..	..	..	7 1 2
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¾ — 4¼	3¾ — 4¼	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	96 — 98 xd	96 — 98	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	136 —139	136 —139	..	..	..	5 15 1
440,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	114 —118	116 —120	117½	117½	+2	5 0 0
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	105 —107	104½ —106½	106	..	— ½	4 13 11
325,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102 —104	102½ —104½	..	..	+ ⅜	10 16 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
135,361	British Electric Traction	10	8 %	Nil	Nil	Nil	32/— 1.5/32	32/— 1.5/32	19/9	16/3	..	Nil
161,427	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	3⅛ — 4	3⅛ — 3⅜	8/9	67/6	— ⅛	7 14 10
1,473,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	90 — 95	91¾	90¼	..	5 5 3
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75	73 — 75	73	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	..	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	6⅛ — 6⅜	6⅛ — 6⅜	6 3/8	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	104 —107	104 —107	104½	..	..	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	..	91 — 96	90 — 95	..	..	—1	4 14 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
1,016,358	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	44 — 49	44 — 49	..	..	..	8 2 4
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 5 % Pref.	2	5 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
120,000‡	Do. do. 4½ % Perp. Deb. Stock	Stock	4½%	4½%	4½%	..	59 — 64	59 — 64	..	..	..	7 0 8
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	38 — 42	38 — 42	..	..	..	10 14 4
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4½ — 5	4½ — 5	98/9	9/-	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4½ — 5½	4½ — 5½	5 1/16	5	..	4 15 3
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100 —103	100 —103	102	..	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9 — 10	9 — 10	9⅜	9	..	7 10 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5½ — 5⅝	5½ — 5⅝	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	106 —108	105 —107	..	..	—1	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅛ — 1⅜	1⅛ — 1⅜	32/-	31/3	..	7 10 4
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	101 —105	102 —106	108½	..	+1	4 4 11
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	3 %	3½%	63 — 65	63 — 65	64½	63½	..	4 13 9
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	84 — 86	84½	..	..	4 12 0
558,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	47 — 49	47 — 49	48½	47½	..	5 2 0
1,480,000	City and South London Railway	Stock	1⅞%	2½%	2½%	1½%	57 — 28	26½ — 27½	27⅝	26⅝	— ⅛	5 9 1
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	5 %	5 %	..	1½ — 1⅝	1½ — 1⅝	27/6	..	..	10 0 0
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	96½	..	..	5 1 0

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 3	2,287	+ 19	36	50,245	— 75	..	..
Ayr	,, 6	354	— 11	38	11,568	— 242	..	..
Bath	,, 3	1,097	— 18	5	3,008	+ 237	..	..
Belfast	,, 5	7,113	+ 368	45	163,911	+ 540	..	..
Birkenhead	,, 7	2,009	— 7	45	47,823	+ 595	18·52	..
Birmingham Corp.	Jan. 30	12,211	— 203	44	280,111	+ 7,610	..	..
Blackpool-Fleetw'd	Feb. 6	446	+ 68	5	1,226	+ 160	..	..
Bolton	,, 7	4,099	— 46	45	103,290	+ 1,553	26	..
Bournemouth	,, 3	2,360	— 136	44	71,982	— 3,289	21·96	..
†Bradford	Jan. 30	4,060	— 36	48	203,345	+ 734	54·9	..
Brighton	Feb. 7	1,358	+ 58	44	40,8·5	+ 1,011	9·5	..
Bristol	,, 5	8,992	— 15	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	Jan. 29	397	— 35	4	898	+ 16	3·65	..
Barnsley	,, 29	309	— 3	,,	648	— 18	..	..
Barrow	,, 29	384	— 30	,,	793	— 51	5 37	..
Cavehill	,, 29	100	— 7	,,	212	— 7	..	..
Devonport	,, 29	710	— 106	,,	1,765	+ 33	8·85	..
Gateshead	,, 29	1,861	— 48	,,	3,923	— 2	11 25	..
Gravesend	,, 29	325	— 29	,,	712	— 30	6·5	..
Greenock	,, 29	823	— 60	,,	1,737	— 42	7·25	..
Hartlepool	,, 29	370	— 73	,,	814	— 104	6·72	..
Kidderminster	,, 29	148	— 14	,,	321	— 9	..	..
Leamington	,, 29	263	+ 12	,,	580	+ 75	3	..
Merthyr	,, 29	378	+ 1	,,	803	+ 36	2·9	..
Metropolitan	,, 29	10,068	+1,142	,,	21,667	+ 3,275	22	..
Middleton	,, 29	527	— 8	,,	1,134	+ 10	8·5	..
Mid. Joint Com'tee	,, 29	10,227	— 520	,,	20,834	— 837	..	..
Oldham—Ashton	,, 29	968	— 62	,,	2,069	— 94	9·13	..
Peterborough	,, 29	172	— 21	,,	376	— 29	5·31	..
Potteries	,, 29	3,329	— 307	,,	7,019	— 464	29	..
Rothesay	,, 29	69	— 14	,,	190	+ 14	2·75	..
Southport	,, 29	417	+ 46	,,	906	+ 136	8·17	..
S. Metropolitan	,, 29	1,235	+ 28	,,	2,786	+ 215	..	..
Swansea	,, 29	1,650	+ 62	,,	3,498	+ 256	12·5	..
Tynemouth	,, 29	228	— 35	,,	5·2	— 60	3·75	..
Weston-s-Mare	,, 29	57	+ 5	,,	113	+ 12	8	..
‡Worcester	,, 29	415	— 25	,,	960	+ 41	5·75	..
Wrexham	,, 29	172	— 5	,,	363	+ 18	..	..
Yorks. Wool. Dist.	,, 29	1,570	— 94	,,	3,390	+ 3	17	..
Miscellaneous	,, 29	335	— 16	,,	721	— 14	..	..
Burnley	Feb. 6	2,193	— 77	..	..	..	..	..
Burton-on-Trent	,, 7	449	— 49	45	12,015	— 640	10	..
Bury	,, 7	1,973	— 14	44½	51,463	+ 1,691	22·5	..
†Cardiff	,, 6	3,794	+ 16	45	96,361	+ 429	..	..
†Carlisle	,, 2	154	— 1	39	9,210	— 34	..	..
Chatham and Dist.	,, 4	1,398	+ 98	5	3,541	+ 442	..	..
Cork	,, 4	824	+ 42	5	2,107	+ 98	9·9	..
Croydon	,, 3	2,319	+ 5	44	61,451	— 267	11·25	·75
†Darlington	Jan. 30	165	— 22	44	8,590	— 699	..	..
Darwen	Feb. 5	424	— 27	44	11,067	— 814	4·96	..
Dover	Jan. 30	275	— 8	44	9,395	— 420	4·75	..
Dublin	Feb. 5	9,459	+ 220	..	25,100	+ 1,002	54·26	5·5
Dundee	,, 3	2,228	+ 78	37§	45,426	+ 1,948	14·5	..
East Ham	,, 6	1,641	+ 29	45	39,639	— 719	8·43	·68
†Exeter	Jan. 29	217	— 15	44	18,760	+ 308	5·5	..
Glasgow	Feb. 6	32,854	— 85	..	614,011	—10,162	90·5	1·5
Hastings	,, 4	1,308	..	..	..	..	..	..
Huddersfield	,, 6	2,832	+ 5	45	70,870	— 365	28·5	·5
Hull	,, 8	4,758	— 84	45	110,814	— 423	13	..
Ilkeston	,, 3	222	— 18	44	6,114	— 97	3·5	..
Ipswich	,, 6	564	— 17	45	17,403	— 290	10·5	..
Kilmarnock	Jan. 30	277	— 1	37	5,667	— 254	4·25	..
Lan'kshire Trm. Co.	Feb. 4	2 337	+ 17	5	6,298	— 384	17	1·18
Lancashire United	,, 3	2,185	+ 17	5	5,677	+ 305	89	1
Leeds	Jan. 30	11,689	— 24	41	287,854	+ 3,692	96·50	·25
Leicester	Feb. 6	3.924	— 86	..	..	..	..	..
Leith	Jan. 30	921	+ 23	37	19,690	+ 58	6	..
Liverpool	,, 30	19,984	— 10	4	44,923	+ 1,785	104	..
‡L.C.C.	,, 30	68,281	+5,241	..	1,526,678	+168,437	121	4·25
London United	Feb. 6	9,110	—1,251	..	26,035	— 366	..	..
Lowestoft	,, 6	225	— 49	19	2,839	— 228	3·5	..
Manchester	,, 6	27,285	— 154	45	673,365	+17,062	90·5	6
Newcastle	,, 6	7,389	— 327	45	175,122	— 8,460	..	..
Newport	,, 6	1,102	— 2	45	29,253	— 1,104	14·5	..
Oldham	,, 7	3,522	— 122	45	87,815	— 449	28·75	..
Pontypridd	Jan. 30	709	+ 114	44	16,747	+ 4,673	5·5	1·75
†Portsmouth	,, 30	1,431	+ 18	44	86,808	+ 1,302	14·5	..
Preston	Feb. 3	1,268	— 33	..	..	..	..	..
†Reading	Jan. 14	1,170	+ 104	41	25,993	+ 11	13·25	..
Rotherham	Feb. 4	1,085	— 69	44	27,079	— 50	10	·66
Salford	,, 1	7,941	— 305	44	202,961	+ 148	41	..
Sheffield	,, 7	10,423	— 201	45½	252.361	— 3,540	37	1·25
Southampton	,, 8	1,738	— 35	44	47,185	+ 1,782	..	..
Southend-on-Sea	,, 3	525	+ 44	45	19,696	+ 1,957	..	..
South Shields	,, 6	970	+ 13	..	25,045	— 277	..	..
†Swindon	Jan. 27	103	— 26	..	..	..	4·4	..
Tyneside	Feb. 3	724	+ 8	5	1,810	— 22	8·87	..
Wallasey	Jan. 30	1,480	+ 92	43½	36,861	+ 2,229	8·72	·22
Walthamstow	Feb. 6	958	+ 4	45	23,098	+ 1,437	9	..
West Ham	Jan. 28	3,954	— 58	44	97,000	— 4,207	15	·3
Wolverhampton	Feb. 8	1,866	— 177	44	36,607	— 1,058	12·5	..
Baker St.-Waterloo	Feb. 6	6,965	+ 745	5	17,280	+ 1,660	4·25	1
Cen. London Rly.	,, 6	11,461	— 641	5	28,428	— 2,638	6·22	·55
Char. +, Eus. Hamp.	,, 7	7,660	+1,345	5	19,355	+ 9,420	6	..
City & S. Lon. Rly.	,, 7	7,030	+ 340	5	17,179	..	7·2	1·05
Dublin-Lucan Rly.	,, 5	219	+ 26	5	549	+ 34	7	..
G.N. and City Rly.	,, 6	3,261	+ 416	5	8,029	— 1,298	3·3	..
G.N., P'dy. & Brmm.	,, 6	11,930	+ 940	5	29,850	+ 2,895	9·25	·25
†L'pool Overh'd Rly.	,, 7	2,533	— 140	5	3,003	— 170	6·6	4·2
Mersey Railway	,, 6	3,917	+ 174	5	9,891	+ 404	4·5	..
Metropolitan Rly.	,, 7	21,492	+1,094	5	50,933	+ 2,733	24·5	..
Met. District Rly.	,, 6	19,507	+1,245	5	49,331	+ 4,154	24	..
Anglo-Argentine	4	50,795	+15,947	5	130,154	+41,495	43	..
†Bombay (B.E.T.)	Jan. 7	2,611§	+ 207	..	..	..	..	..
‡Brisbane	Jan.	15,960	+1,020	..	..	..	..	..
Calcutta	Feb. 6	5,525	+ 992	..	..	..	..	..
‡Kalgoorlie, W.A.	Jan.	3,720	..	..	..	..	20·5	..
Madras	,, 31	1,400	+ 69	4	2,839	+ 196	12·75	..
Perth (W.A.)	Feb. 5	3,069	+ 144	5	7,935	+ 175	25·6	..

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Prospects in the Money Market are considered to favour the idea of cash becoming cheaper in the near future. Therefore Consols and several of the best new issues in their department have risen appreciably, affecting most of the other investment sections. Business is somewhat erratic, but investors are making their presence felt all round the Stock Exchange.

Of the new issues in the electricity world, Anglo-Argentine Tramways new Debenture, after dipping to 2⅜ discount, rallied 1½, and the new Mexico Tramways 6 per cents. are 1½ discount, after being lower. The underwriters had to take about 75 per cent. in the case of the Anglo-Argentine Tramways stock, and 83 per cent. of the Mexico Tramways bonds.

Electricity Supply shares are a steady market, the dividends on the Metropolitan Companies' shares not influencing prices to any quotable extent. The City Company's declaration, making the usual 6 per cent. for the year, made the Ordinary shares a shade easier. St. James' remained at their lowered level of 8§, the dividend being kept at 10 per cent. The profits show a fair increase upon those for 1907. The South London Electric has declared a dividend of 5 per cent. London Electric Ordinary are ⅛ better. The South Metropolitan's recent issue had to be liberally shouldered by underwriters.

Hove Electrics at ⅛ better, but Newcastle-on-Tyne shares continue to dwindle. The selling seems to come mostly from the country. Some of the Debenture stocks are better.

The Canadian group is very animated, especially as regards the Mexican issues. Prices are better to the tune of ½ to 3 points. Rio Trams attract a good deal of attention, having risen at last to par, and the bonds are 92¾. Sao Paulo Trams hardened to 164½. Mexico Trams are none the worse for the equivocal success achieved by the issue of the 6 per cent. bonds. The coming meeting at Toronto has now lost most of its interest, but it would be surprising were the speculators to miss the opportunity which it still presents for manœuvering the prices of Mexico Trams and Mexican Lights. Canadian General Common shares recovered to 114½ after being easier, and the 7 per cent. Preference stock is 116.

Many of the stocks of the steam railway companies are better on the week, but no miracle or volcano has occurred to raise the prices of electrical railway securities. The only share in this department to give evidence of strength is Great Northern, Piccadilly and Brompton, the price of the Ordinary gaining nearly 10s., to 8⅜. The 4 per cent. Debenture stock firmed up to 92. Baker Street and Waterloo Debenture changed hands on Monday at 95¼.

Central Londons remain depressed. The market does not greatly relish the idea of a yet further rearrangement of the fares such as the Board hint at in the report. City and South London steadily declines, and the older Undergrounds have reacted, Districts losing ¼ and Metropolitan ½.

Further support caused London United Tramways Debenture stock to gain a point, but British Electric Preference eased off to 3§, a fall of half-a-crown. Anglo-Argentine Trams are a quiet market, both classes of Preference shares suffering slightly in consequence of the poor response of the public to the company's invitation to apply for the new Debenture stock. British Columbia Electric Railways varieties are a little irregular, but the alterations possess no significance.

Telegraph descriptions are principally noticeable for the gain of another 1s. 3d. in Marconi shares, which has raised the price to 16s. 3d. This means that the shares are 50 per cent. higher than they stood a fortnight ago, prior to the news of how the system saved so many lives on the ss. *Republic*. The American division is better, Anglo Preferred gaining 2, and the Deferred at 13⅜ being the fraction higher, after touching 13⅝. Amazon Telegraphs are ⅛ up, American Telephone and Telegraph capital stock is 2 points better. National Telephones are unchanged. Telegraph Constructions eased off, but the manufacturing division, as a whole, is steady and without noticeable feature.

Rubber shares are developing more activity, but prices swing erratically, as the market is very easily moved. The statement in some of the papers to the effect that the market in rubber shares has shifted from the Stock Exchange to Mincing Lane makes up in inspiration what it lacks in veracity.

Belgium.—La Compagnie d'Electricité et de Mecanique is the name of a new company which has just been formed in Brussels with a capital of £2,000.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 2nd.	Closing Quotations Feb. 9th.	Business done week ended Feb. 9th, 1909. Highest	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅜ — 3⅛	2⅜ — 3⅛	..	..	+ ⅛	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,350 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 5 1
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½ %	8 %	8 %	..	128 —131	130 —133	131¼	131	+2	6 0 4
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 58,001 to 78,000	$1000	4 %	4 %	4 %	4 %	94 — 96	95 — 97	..	..	+1	4 2 6
598,180	Anglo-American Telegraph	Stock	3½ %	6⅞ %	3½ %	£3 4s.	54 — 57	55 — 58	..	..	+1	5 5 3
8,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	97 — 99	99 —101	100	98½	+2	5 18 10
8,200,910	Do. do. do. Deferred	Stock	½ %	12½ %	1 %	8/-	1⅞ — 1⅝	1⅝ — 1⅞	13/8	12/8	+ ⅛	2 17 9
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅜	7⅞ — 8⅜	..	..	..	4 15 6
2,481,350	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	85 — 87	84½ — 86½	85½	84⅜	— ⅛	4 12 6
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7½ — 8½	7½ — 8½	..	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 14 3
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	..	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½ %	4½ %	4½ %	4½ %	99 —102	99 —102	..	..	..	8 16 6
60,710‡	Direct United States Cable	20	4½ %	4½ %	4½ %	4½ %	12 — 12½	12 — 12½	12⅜	12	..	6 16 0
53,700‡	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,300, R.	100	4½ %	4½ %	4½ %	4½ %	99½ —101½	99½ —101½	101¼	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	126 —129	126 —129	127½	126½	..	5 8 6
2,000,000	Do. 8½ % Pref. Stock..	100	8½ %	8½ %	8½ %	..	84 — 87	84½ — 86½	86	85	+ ½	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½ —105½	103½ —105½	104½	103⅞	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	11⅝ — 12½	11⅝ — 12½	12⅛	11⅛	..	5 14 3
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	99½ —101½ xd	99½ —101½	101	100½	..	3 18 10
200,000‡	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½ —102½	100½ —102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5⅛ %	5⅛ %	5⅞ %	..	10 — 10⅛	10 — 10⅛	10⅜	10⅛	..	5 14 8
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	..	12⅜ — 13⅜	12⅜ — 13⅜	13½	12⅜	..	4 7 3
150,000	Great Northern Telegraph, of Copenhagen ..	20	20 %	20 %	20 %	..	30 — 32	30 — 32	..	..	..	6 5 0
24,300‡	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½ %	4½ %	4½ %	4½ %	99½ —101½	99½ —101½	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	52 — 55	52 — 55	..	..	..	6 16 4
$41,880,400	Mackay Companies Common	$100	2 %	3½ %	4 %	4 %	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	71 — 74	..	..	..	5 12 8
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅞ — 1	⅞ — 1	17/6	15/6	+ 1/16	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	7/8 — 15/16	7/8 — 15/16	..	..	..	6 0 9
86,492	Do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	3/4 — 7/8	3/4 — 7/8	..	..	..	5 3 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	110½	108½	..	5 7 7
3,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	120½ —122½	120½ —122½	121¾	120½	..	4 18 0
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5 1/16 — 5 3/16	5 1/16 — 5 3/16	5 1/8	5 1/16	..	4 5 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½ %	3½ %	3½ %	3½ %	97 — 99	97 — 99	97⅜	97	..	3 10 11
1,716,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½ —101½	99½ —101½	100⅜	99½	..	3 18 10
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	11⅛ — 12 5/16	11⅛ — 12 5/16	..	..	..	5 16 1
50,000	Do. do. do. 6 % Cum. Pref... ..	1	6 %	6 %	6 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	89½	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,839‡	Reuter's	8	5 %	5 %	5 %	..	7 — 8	7 — 8	7	..	..	5 0 0
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½ %	4½ %	4½ %	4½ %	99 —101	99 —101	100⅛	99⅜	..	4 9 1
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	127⅞	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅞ — 7	6⅞ — 7	6⅞	..	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅜ — 5⅜	4⅜ — 5⅜	5 1/16	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 58,008	2½	Nil	2½ %	2½ %	..	1⅛ — 1⅜	1 15/16 — 1 1/16	34/1⅛	31/10½	+ 1/16	4 2 6
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99½ —101½	99½ —101½	..	..	..	3 18 10
207,930	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	12⅜ — 13⅜	12⅜ — 13⅜	13⅛	12⅜	..	5 5 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	3/8 — 13/16	3/8 — 13/16	..	..	..	Nil
34,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7/8 — 8⅛	7/8 — 8⅛	8⅜	..	..	7 7 8
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7⅜ — 8⅜	7⅜ — 8⅜	..	..	..	2 14 1
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

320,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	..	8 13/16 — 9 1/16	8 13/16 — 9 1/16	9 15/16	8⅜	..	4 19 2
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅛ %	5⅛ %	5⅛ %	..	6 — 6½	5⅞ — 6 1/16	6	5⅞	— 3/16	4 15 3
266,800	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	137 —142	137 —142	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	102⅜	..	..	4 17 1
880,000	Babcock & Wilcox, 1 to 880,000..	1	20 %	20 %	20 %	..	3 15/16 — 4 1/16	4 1/16 — 4 1/8	84/0	80/-	+ ⅛	4 15 10
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	b 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2	1⅞ — 2	..	..	..	17 10 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3⅜ — 3⅝	3⅜ — 3⅝	..	..	..	8 19 5
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	7 1 2
12,597	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3½ — 4⅛	3⅝ — 4⅛	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½ %	5½ %	5½ %	96 — 98 xd	96 — 98	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	136 —139	136 —139	..	..	..	5 15 1
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	114 —118	116 —120	117⅜	117½	+2	5 0 0
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	105 —107	104½ —106½	106	..	— ⅛	4 13 11
223,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½ %	4½ %	4½ %	4½ %	102 —104	102⅜ —104⅜	..	..	+ ⅛	10 16 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½ %	4½ %	4½ %	4½ %	101 —104	101 —104	..	..	..	4 6 7
133,351	British Electric Traction	10	3 %	Nil	Nil	..	29/32 — 1 5/32	29/32 — 1 5/32	19/9	16/3	..	Nil
161,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	3¾ — 4	3⅝ — 3¾	68/9	67/6	— ⅛	7 14 10
1,473,668	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	90 — 95	90 — 95	91¾	90¼	..	5 5 3
528,986	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½ %	4½ %	4½ %	4½ %	73 — 75	73 — 75	73	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	..	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	6¾ — 6⅞	6¾ — 6⅞	6⅞	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½ %	4½ %	4½ %	4½ %	104 —107	104 —107	104½	..	..	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½ %	4½ %	4½ %	..	21 — 96	90 — 95	..	..	—1	4 14 9
400,000	British Westinghouse 6 % Pref., 1 to 300,000 and 375,001 to 475,000	5	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	44 — 49	44 — 49	..	..	..	8 2 4
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,731 ..	2	2½ %	Nil	Nil	..	0 — ⅛	0 — ⅛	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
120,000‡	Do. do. 4½ % Perp. Deb. Stock	Stock	4½ %	4½ %	4½ %	..	59 — 64	59 — 64	..	..	..	7 0 8
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½ %	4½ %	4½ %	..	38 — 42	38 — 42	..	..	..	10 14 4
137,610	Calcutta Trams, 1 to 137,610	5	8 %	8 %	6 %	..	4⅛ — 5	4⅛ — 5	98/9	9 /-	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,380..	5	5 %	5 %	5 %	5 %	4⅛ — 5⅛	4⅛ — 5⅛	5⅛	5	..	1 15 3
850,000	Do. 4½ % 1st Deb. Stock..	100	4½ %	4½ %	4½ %	4½ %	100 —103	100 —103	102	..	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9 — 10	9 — 10	9⅜	9	..	7 10 0
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½ %	4½ %	4½ %	4½ %	106 —108	105 —107	..	..	—1	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅛ — ¼	⅛ — ¼	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅛ — 1⅜	1 15/16 — 1 1/8	22/-	21/3	..	7 10 4
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½ %	4½ %	4½ %	..	101 —105	102 —106	105⅝	..	+1	4 4 11
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	8 %	3½ %	63 — 65	63 — 65	64½	63½	..	4 13 9
558,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	84 — 86	84 — 86	84½	..	..	4 12 0
558,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½ %	47 — 49	47 — 49	48⅜	47½	..	5 2 0
1,480,000	City and South London Railway	Stock	1½ %	2½ %	2½ %	1½ %	27 — 28	26½ — 27½	27⅝	26⅝	— ⅛	5 9 1
55,000	Crompton & Co., Nos. 1 to 55,000	3	2½ %	5 %	5 %	..	1½ — 1⅝	1½ — 1⅝	27/6	..	..	10 0 0
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	96½	..	..	5 1 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 2nd.	Closing Quotations Feb. 9th.	Business done week ended Feb. 9th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 3/16 — 1 5/16	1 3/16 — 1 1/4	..	..	— 1/32	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	22/8	..	..	5 1 1
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6¼%	6 %	11⅜ — 12⅛	11⅜ — 12⅛	..	..	..	5 4 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	† 5	4½%	4½%	4½%	..	7/16 — 7/16	7/16 — 7/16	9/9	7/9	..	16 15 3
17,189	Do. "A" shares, 01—017,189	† 5	4½%	4½%	4½%	..	1⅛ — 2⅛	1⅛ — 2⅛	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	75 — 78	75 — 78	..	..	..	5 2 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 — 89	86 — 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890..	2	7 %	7 %	7 %	7 %	1⅛ — 1⅛	1⅛ — 1⅛	..	..	..	9 6 9
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7 — 7½	7 — 7½	..	..	..	6 13 4
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 89	85 — 99	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	Nil	⅛ — ¼	⅛ — ¼	..	..	— 1/32	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10⅛ — 10⅜	10⅛ — 10⅜	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	..	11⅜ — 12⅜	11⅜ — 12⅜	11 13/16	11⅜	..	5 17 8
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	..	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105½—107⅛	105½—107⅛	..	..	..	4 3 9
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	10%	10 %	10 %	..	15½ — 16½	15⅝ — 16⅝	..	..	..	6 1 8
87,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	1/8	..	1 — 1⅛	1 — 1 1/16	..	..	+ 1/16	5 6 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	..	4 — 4½	4⅛ — 4⅝	..	..	+ 1/16	9 1 10
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	..	6⅛ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
899,930	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	..	6⅛ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	..	4 — 4⅛	4 — 4⅛	86/8	88/1	..	11 2 2
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 74	71 — 75	74	..	+ 1	6 0 0
5,782,062	Metropolitan Consolidated	100	2⅜%	1 %	1⅜%	..	26½ — 27½	26 — 27	26⅜	26⅛	..	1 6 8
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	69 — 71	69 — 71	70⅛	69⅛	..	3 17 6
3,235,000	Do. District	100	Nil	Nil	Nil	Nil	14½ — 14⅝	14 — 14½	14⅜	14⅛	— ⅛	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	⅜ — ½	⅜ — ½	..	..	..	5 19 5
600,000	Do do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	93 — 95	93 — 95	93½	..	..	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	141½—143½xd	143 —145	144½	141	+ 1½	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	..	92 — 95	94½ — 95½	95½	94½	+ 1½	..
245,500	Potteries E. Trc.	1	4 %	4 %	4 %	..	⅜ — ½	⅜ — ½	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	⅜ — ½	⅜ — ½	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	90 — 93	90 — 93	..	..	..	4 14 9
97,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	23½ — 24½	23½ — 24½	24½	23⅞	+ ⅛	5 4 4
150,000	Do. 4 % Deb. Bds., 1 to 1.500 Red., 1909	100	4 %	4 %	4 %	4 %	99½—101⅜	99½—101½	101	..	..	3 18 10
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	98½ — 99⅜	98½ — 99½	99	..	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	81 — 83	80 — 82	..	..	— 1	5 9 9
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	26 — 28	26 — 28	27½	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	10 %	..	3/16 — 7/16	3/16 — 7/16	..	..	..	10 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	..	6 %	..	2⅜ — 2¾	2⅜ — 2¾	..	..	..	10 8 8
246,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5⅛%	5⅛%	5⅛%	..	4⅛ — 5	4⅛ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 98	94 — 98	..	..	..	4 10 0
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	..	8⅜ — 8⅝	8⅜ — 8⅝	..	..	..	5 12 8
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	8 — 8⅜	8 — 8⅜	..	..	..	4 2 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 —101	98 —101	..	..	..	3 19 3
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	..	4⅛ — 4⅜	4⅛ — 4⅜	91/8	87/6	..	5 2 7
80,000	Do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	..	4⅛ — 4⅜	4⅛ — 4⅜	90/-	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Pri.	5	4½%	4½%	4½%	..	4⅛ — 4½	4⅛ — 4½	76/8	..	..	5 5 11
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	..	4⅛ — 4½	4⅛ — 4½	..	..	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red.	..	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10⅜ — 11	10⅜ — 11	10⅜	10 11/16	..	5 6 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 12⅜	12 — 12⅜	..	..	..	4 14 1
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	101½	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅝ — 3	2⅝ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3⅛ — 3⅜	3⅛ — 3⅜	..	..	..	6 13 4
200,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	..	8⅜ — 9⅛	8⅜ — 9⅛	9 1/16	..	..	5 8 1
50,997	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	..	10⅜ — 11⅛	10⅜ — 11⅛	11	..	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	..	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	101½	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	3 %	Nil	..	1/8 — 3/16	1/8 — 3/16	14/6	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 62	59 — 62	..	..	..	7 0 8
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	..	86 — 87	85 — 87	86	85⅞	..	..
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	..	6⅞ — 6⅞	6½ — 7	..	..	+ 1/8	6 1 5
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	96 — 98	96 — 98	..	..	..	5 3 1
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	..	7⅞ — 8⅛	7⅞ — 8⅛	8	..	..	6 1 3
90,000	Do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	95 — 98	93 — 96	..	..	—2	4 4 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	+ 1/8	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜ — 5⅛	4⅜ — 5⅛	5	..	..	5 14 3
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	89 — 93	90 — 94	..	..	+1	4 5 1
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6¼%	..	4⅝ — 5⅛	4⅝ — 5⅛	5	..	..	6 6 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	..	4⅛ — 5	4⅛ — 5	93/9	..	..	4 10 0
220,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —108	106 —109	..	..	+1	4 2 7
248,000	Do. 3½ % Mort. Deben. Stock Redeem.	Stock	3½%	3½%	3½%	3½%	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	87 — 88	87⅞ — 88½	88	87⅝	+ ⅛	5 13 0
13,585,000	Do. Light and Power Co., Ltd., Common	..	$100	..	..	..	3½% 83⅛ — 85⅛	84 — 86	85⅛	83⅛	+ ⅛	4 1 5
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	109 —111	110⅜—112½	112	111	+1⅜	6 4 5
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	90 — 91	91 — 92	91⅝	90½	+1	5 8 8
350,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	..	4 — 4⅛	3⅞ — 4⅛	..	..	— ⅛	9 2 10
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	100 —102	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	..	11⅛ — 12⅛	11⅛ — 11⅝	..	..	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	5⅞ — 6⅛	5⅞ — 6⅛	..	..	..	5 9 10
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	..	..	1⅝ — 1⅞	1⅝ — 1⅞	24/4½	20/-	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos.1 to 100,000	1	6	6	6	..	1⅝ — 1⅞	1⅝ — 1⅞	..	..	..	..
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	5	5 %	99 —102	99 —102	..	..	..	4 18 0
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅜ — 8⅞	8⅜ — 8⅞	8⅝	8½	..	5 12 8
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6⅞ — 7⅛	6⅞ — 7⅛	..	..	..	4 16 7
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	63 — 70 xd	63 — 70	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	4	4 %	3 %	4 %	..	2⅛ — 2⅜	2⅛ — 2⅜	..	..	..	6 10 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	..	3/16 — 5/16	3/16 — 5/16	..	..	..	3 6 8
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	..	1⅝ — 1⅞	1⅝ — 1⅞	24/4½	..	+ 1/32	5 12 0
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100—103	100 —103	..	..	..	4 7 5
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	⅝ — 1	⅝ — 1	..	..	..	20 0 0
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅝ 2	1⅝ 2	..	..	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 83	80 — 83	..	..	..	5 8 3
866,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	1⅜ — 1⅝	1⅜ — 1⅝	17/8	..	..	..
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	2⅝ — 2¾	2⅝ — 2¾	2¾	2⅝	..	5 14 3
81,379	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	5 5/16	5⅛	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

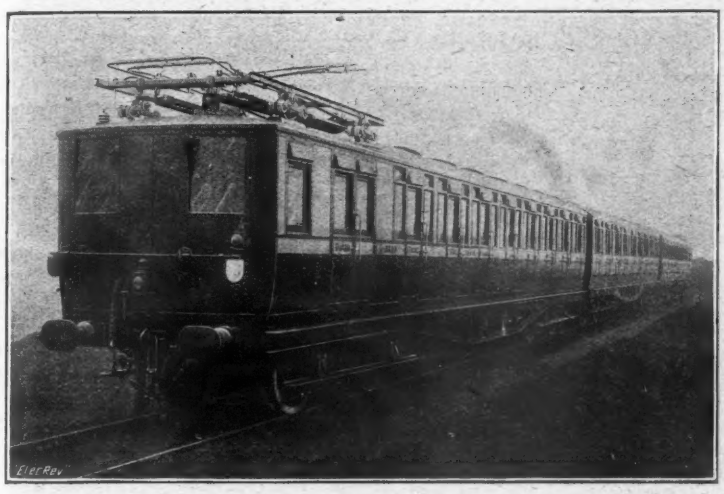
Bank rate of Discount, 3 per cent., January 14th, 1909

RAILWAY ELECTRIFICATION.

By PHILIP DAWSON.

(*Concluded from page* 206.)

Having thus generally considered the reasons which should in the near future bring about the very general adoption of electric traction on railways, we will now discuss the various systems, by which electricity can be utilised most satisfactorily for traction purposes.



Complete Single-phase Train, L.B. & S.C. Railway.

For all practical purposes there are three systems, and three only, which can be considered for traction purposes. They are :—

The continuous or direct-current system.

The three-phase system.

The single-phase system.

The first of these systems is that which has so far been most generally adopted ; it involves the use of continuous-current motors of the series type.

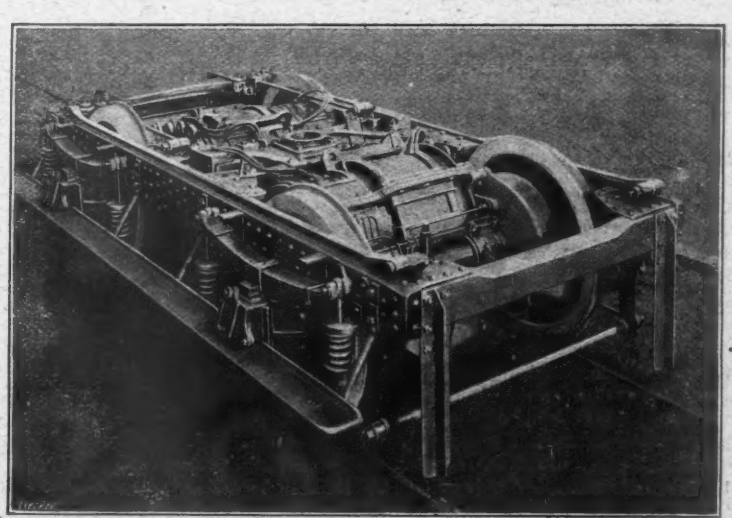
The usual difference of potential or electrical pressure between the terminals of these motors is from 500 to 600 volts. Motors have been constructed, at the terminals of which it is possible to employ 1,000 volts, and by keeping a group of two motors of this description constantly in series, it has been possible to utilise a line pressure of 2,000 volts with continuous-current motors. It is evident that in this case all the controlling apparatus and the lighting circuits must be insulated to 2,000 volts. It is claimed by some designers that motors can be constructed to operate satisfactorily at 2,000 volts, and by putting two of these in series, it might be possible to utilise a line pressure of 4,000 volts, but such construction has never yet been carried out in practice.

The introduction of such high pressures, it should be noted, would introduce very serious dangers in maintaining and looking after motor equipments, as there must always be a liability of getting a shock, with the full line pressure, when touching any part of the apparatus, and furthermore, all the motors and the apparatus generally would have to be insulated to withstand the whole working pressure. In order to regulate the speed of continuous-current motors, it is necessary to regulate the pressure between the terminals of the motors, and this, for a considerable portion of the operation, can only be done by absorbing pressure by means of resistances, which is necessarily an inefficient mode of working. The continuous-current system of traction has been very successfully utilised in the past in connection with railway work ; it requires the use of a third rail, insulated, and situated above the level of the ordinary rails, and which serves to conduct current to the motors on the train.

Where earthed returns are used, the Board of Trade, where it has jurisdiction, limits the return drop to 7 volts. With the very large currents required in railway work, this practically means the adoption of an insulated rail return, as has been done by the District, the Metropolitan and the Great Western Railways in London. The very large amount of power required for railway work has to be distributed over considerable distances, and in order to secure economy both as regards first cost, and in the generation of current, it is necessary to reduce the number of power stations as much as possible, or in other words, to centralise the same to the utmost possible safe extent. Under these conditions, in order to transmit economically as well as to reduce the size and number of feeder cables required, the current is usually generated in the form of alternating current.

Only careful calculations in every individual case can possibly give the amount of sub-station plant which would have to be put down, but, generally speaking, it can be stated that experience has shown that the sub-station plant is anything from one and a quarter to twice the capacity of the plant installed at the generating station.

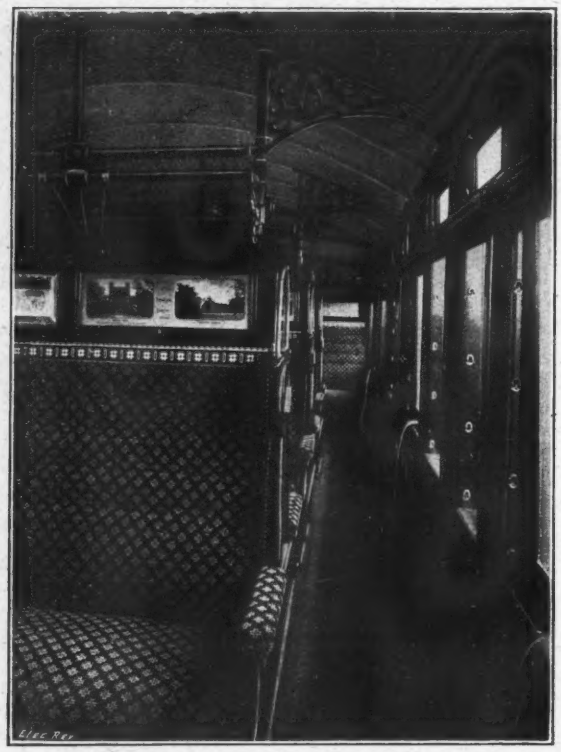
The second system is the three-phase system, which has been used with quite satisfactory results on some long-distance railways in Switzerland and Italy, as well as on several short mountain lines in Switzerland. In this case the current is usually brought to the motors by means of overhead conductors, two in number, the rails acting as a third conductor ; at all points and crossings the overhead conductors which carry different phases have to be insulated from each other ; and furthermore, the collecting devices on the top of the cars or locomotives have also to be insulated in a similar way from each other. Experience has shown that the maximum pressure that can safely be utilised between two such working conductors is 3,000 volts. It therefore follows that for long-distance lines, sub-stations containing static transformers will have to be put down in order to reduce the



Bogie Truck equipped with Single-phase Motors.

pressure to that at which the current has to be supplied to the working conductor.

The last method, and the one which has recently been most perfected, is that known as the single-phase system. In this method single-phase alternating-current motors, fitted with commutators, are employed, the design of which is



Interior of Third-Class Coach, L.B. & S.C. Railway, Showing Gangway.

very similar to the latest form of continuous-current traction motor, and which, in fact, are so constructed that they can equally well be operated either by continuous or alternating currents. The maximum pressure at which the current is supplied to the terminals of these motors varies according to their type, from 300 to 750 volts. The latter pressure is that at which the compensating repulsion type of motor, as designed by Dr. Eichberg, and constructed by the Allgemeine Elektricitäts Gesellschaft, can operate. The motors constructed by most of the other makers are of what is called the series type, and in this case, so far, it has not been practicable to use current at greater pressure than 300 volts at the terminals of the motors.

In the case of the single-phase system current has been supplied to the overhead conductor at a pressure as high as 22,000 volts, from which it is collected by means of sliding contact or bow collectors and transmitted to static transformers on the car, which transform the current to the pressure at which it is utilised in the motors. All the controlling and auxiliary apparatus is in the low-tension circuit, and the same applies to lighting and heating. All the speed regulation is done by varying the steps of the transformer, and thus the voltage at the motor terminals can be varied as may be required. The single-phase motor has the advantage of possessing practically all the qualities of the continuous-current series traction motor, and is therefore eminently suitable for traction work.

As a matter of fact, it may be generally stated that for ordinary suburban work, a line pressure of about 10,000 to 11,000 volts will be found sufficient, and the advantages of this pressure will easily be realised when it is seen that it is about 20 times higher than what has heretofore been the working pressure in connection with continuous-current railway working, so that a train requiring a current of from 1,500 to 3,500 amperes at 500 volts would, on the basis of 10,000 volts, only require from 75 to 175 amperes. It will also be obvious that taking 10,000 volts as working pressure, this can be generated directly in the machine, transmitted and utilised in the overhead line, all at the same pressure, thus doing away with the sub-stations, and the necessity for static transformers, and the complicated switch-gear required for controlling the latter.

In comparing the single-phase with the continuous-current system, it may be stated that the single-phase motor is from 15 per cent. to 25 per cent. heavier than the corresponding continuous-current motor, and in addition to this there is the weight of the transformers. It follows that, for the present, at least, the single-phase equipment of a train must be more costly than the corresponding continuous-current equipment. As regards the question of total weight a complete train equipped with single-phase motors will, under ordinary conditions, not be more than 10 per cent. heavier than the same train equipped with continuous-current plant. There is no reason to anticipate that the cost of maintenance should be materially greater with single-phase than with continuous-current apparatus, and it must be admitted that if there are any material advantages from a railway point of view to be gained from the addition of 10 per cent. to the weight of the trains, no railway manager would hesitate one moment in adopting such additional weight.

Taking the cost of energy at anything from $\frac{1}{3}$d. to $\frac{1}{2}$d. per unit, such additional weight would only mean an extra cost of something like $\frac{1}{2}$d. per train-mile, which is quite insignificant when we consider the fact that locomotive charges at the present moment on our railways amount on the average to about 1s. per train-mile, of which fuel is accountable for about half. In considering these figures it must be recollected that they are for the average train-mile on our railway systems, and that considering the bad conditions under which a locomotive works when hauling suburban trains, if figures were available only for this branch of the service, they would certainly come out much higher.

Interior of Driver's Compartment, Showing Single-phase Controller, &c.

The only disadvantages alleged against the single-phase system, as compared with the continuous-current system, are the additional weight and consequently increased first cost, and the slightly lower efficiency of the motors.

The only rational basis of comparison is one instituted between two trains, which are identical, except for the system of electrical equipment. The maximum difference between the two systems under these conditions may be taken as represented by an increase of about 10 per cent. in the total train weight. The cost of the single-phase train equipment is certainly higher than that of the equivalent continuous-current plant, but this item cannot be considered by

itself, and independent of the whole system. The continuous-current motor innolves the use of converter sub-station plant, and additional cost in feeding and distribution. No general rule can be laid down as to what this may mean, and each case will have to be investigated on its own merits, but for any large and comprehensive scheme, there should be a saving on the complete installation, including power and sub-stations, of from 20 to 30 per cent. It must be remembered that even if power is purchased from outside, in making the selling price the entire capital cost, as well as cost of maintenance of the sub-station plant, will have to be provided for in the price at which the power is purchased.

As regards efficiency, although it is true to say that, for the smaller sizes, continuous-current motors are more efficient than single-phase motors, it must not be forgotten that if the power generated is taken into consideration the continuous-current system involves losses in the sub-station and transformation which do not exist in the case of the single-phase system. The net result is that as regards this point there is little to choose between the two systems, but if anything the results, as far as this point is concerned, appear to be in favour of the single-phase system.

In conclusion, it must be pointed out that, so far as all the experience gained during the last few years is concerned, it has resulted in most railway engineers becoming convinced that the single-phase system, as now being completed on the South London line, is the best for general railway purposes from all points of view. As a support to these conclusions, the decisions arrived at by other railway authorities and engineers within recent times, as to the system most advantageous from a railway point of view, may be briefly recapitulated.

The chief engineers of the Swedish Government, after most careful investigations and tests, extending over years, have just published a report, in consequence of which the Swedish Government have decided to electrify a large portion of their railways on the single-phase system.

The Swiss Government and their engineers have also been investigating electric traction, and reports recently issued by them state that their investigations and experiments have resulted in the same conclusion being arrived at, *i.e.*, that the single-phase is the only system which can be adopted.

The Government railway authorities of the Grand Duchy of Baden, in Germany, have been investigating the whole question on their own account, and they have decided on, and, indeed, have actually let a contract for, the equipment of a portion of their railway on the single-phase system.

The Minister of Railways and the engineers of the Bavarian Government have been carefully studying the matter, and have issued a voluminous report in which they prove that, for heavy suburban as well as long-distance traffic, the only rational system to be adopted is the single-phase one, and they strongly recommend the Government immediately to commence the electrification of a portion of their lines on this system.

The Grand Trunk Railway of Canada have just completed and opened for public service, on the single-phase system, that portion of their line which goes under the St. Clair River.

It should also be mentioned that the Midland Railway Co., after considering the question of electrification, decided to install the single-phase system on their Lancaster and Heysham line, and that this is working quite satisfactorily.

Last, but not least, the Prussian State Railways and their electrical adviser, Herr Geheimrat Wittefeld, have for many years had the whole subject of electrification under consideration, the result of which has been the equipment of the suburban railways in and around Hamburg, on the single-phase system. Subsequently to the opening of this line, the adviser of the Prussian Government paid a long visit to the United States, and the result of this investigation, as well as the operation of the Hamburg line, has convinced him that the only system which can be considered in connection with the electrification of the very large and important lines in and around Berlin is the single-phase one, and the Minister of Railways has adopted his recommendation to equip the whole suburban system of Berlin (Stadtbahn) at a cost of about 10 millions sterling, on the single-phase system. This last decision is of the greatest importance, because it must be borne in mind that the first electrification carried out on the Prussian State Railways was on the continuous-current third-rail system in Berlin itself, between Berlin and Gross Lichterfelde; therefore this decision is not based only on the results of their careful investigations in Europe and America, but also on actual experience of the operation side by side, under the same administration, of the two systems.

Mr. Wittefeld has stated to the writer that all the investigations which he has made, and all the experience he has gained in connection with railway electrification, have only strengthened the opinion which he has formed—that the single-phase system is the only satisfactory method of working a main-line railway. As a result of this, all the projects which are under consideration or are going to be considered by the Prussian Government Railways, including the Berlin suburban systems above mentioned, are being worked out only in connection with the use of the single-phase system.

The illustrations which accompany this article will serve to show how the single-phase system is being carried out on the South London line of the L.B. & S.C. Ry. The whole of the rolling stock was designed by the author, and constructed under his supervision by the Metropolitan Amalgamated Carriage and Wagon Co., of Birmingham.

Finally, it may be stated that whilst in the past the continuous-current motor has given every satisfaction for traction purposes, it has not fulfilled many of the most important requirements of main-line railways, including those of the suburban sections of such systems. There is little doubt that the single-phase motor, which is of comparatively recent origin, has met most, if not all, of the requirements set by railway men to such an extent that it would appear as if future main line railway electrification would very largely, if not entirely, be carried out on this system. It presents equal advantages for short-distance and for long-distance work, a condition which is of great importance when the electrification of any section of a main line railway is under consideration.

THE ROUTIN AUTOMATIC REGULATOR.

An ingenious and effective system of automatic regulation has been devised by Mr. J. L. Routin, of which a brief description is given below. The inventor has made a very thorough study of the question of the regulation of electric generators, and has arrived at certain broad principles which indicate the conditions under which satisfactory and stable working is possible. He takes account for the first time of the influence of the inertia of the motors fed by the network, and of the possibility of making the speed of working of the regulator proportional to the amplitude or to the rate of the variation which it is designed to correct; the former alternative is adopted in the Routin system, for which the following advantages are claimed:—It supersedes mechanical governors for speed regulation, thus eliminating the errors due to their friction, inertia, oscillation, and inefficiency, and brings into action far greater controlling forces, whilst permitting also the regulation of all the generators from one central point, and if necessary providing for increase of voltage on a rising load, to compensate for loss in the feeders. Unlike regulators of the Tirrill type, the Routin regulator is applicable not only to generators, but also to boosters at distributing points; as compared with the Thury system, which works at constant speed, regardless of the amplitude of the variation to be corrected, its working speed may be made proportional to the degree of variation, its action thus resembling that of an intelligent attendant. Sparking at the contacts is eliminated by special patented devices, and the working parts should last for years.

The regulator can be employed indifferently for controlling pressure or speed; in the latter event a small auxiliary generator is required, which gives a voltage proportional to the speed. As an electro-mechanical regulator, it is applicable also to the control of pressure at the ends of the feeders, the regulation of electric furnaces, rolling mills, &c., and all cases in which it is required to keep constant the output of an electric motor.

The illustration overleaf shows the system applied to the control of a generator to give constant pressure. In this case it consists in principle of a voltmeter, a system of relays, and a motor which actuates the rheostat controlling the excitation.

1 is the arm of a balance, turning on a pivot at 2; 3, a coil suspended from the beam and pulled downwards by the magnetic field of coils 4 and 5. Coils 3, 4 and 5 are connected through an auxiliary resistance 6 to the terminals G of the generator controlled; 7 is a balance spring, keeping the beam horizontal at normal voltage; and 8 is a permanent magnet attached to the beam. When the voltage falls, contact is made between pole 9 and

a steel spring 10, so that the electromagnet 11 is placed in shunt to points 12 and 13 of the potentiometer resistance, fed with direct current from a source connected to the terminals 14 and 15. The armature 16, pivoted at 17, is attracted and makes contact with 18; the armature of the motor 19, which drives the rheostat, is thus set in motion, so as to increase the excitation of the generator, the motor field 20 being fed from the D.C. source. Directly the contact between 9 and 10 is broken, the lever 16 is pulled by the spring 21 into contact with 27, short-circuiting the motor armature and quickly stopping its motion.

The contact 18 is mounted on a spring, and thus after touching 18, the lever 16 comes into contact with 22, and closes a circuit through the electromagnet 24. This tends to lift the end of the beam and break the contact 9-10 before equilibrium has been re-established, and thus prevents running past, but its effect is removed directly the contact is broken. The motion of the beam is damped with the dash-pot 26. So long as the variation of pressure remains above a value determined by the air-gap 25, the motor runs at its maximum speed; but directly the variation is reduced within the prescribed limits the armature advances only by jerks, and its mean speed is the less as the correction to be made diminishes. The air-gap 25 is adjustable.

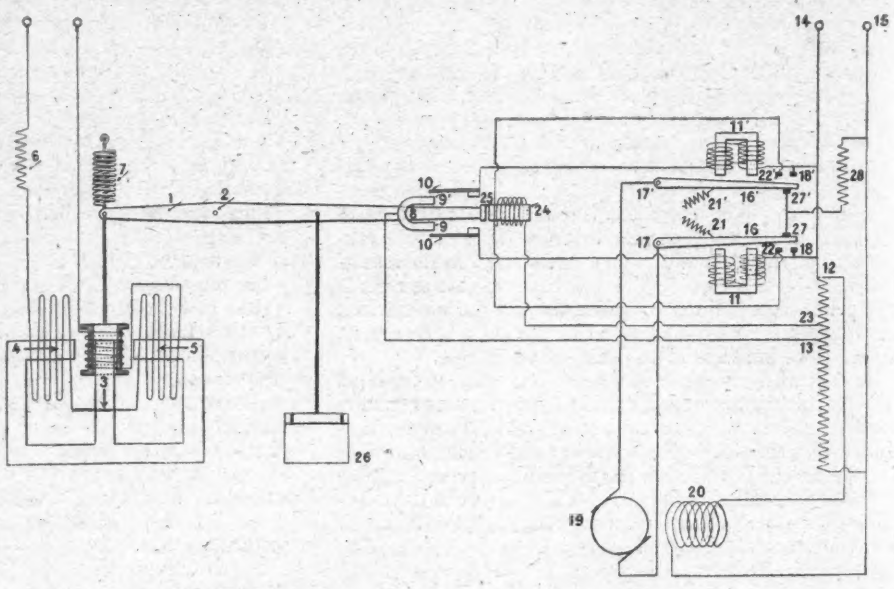


DIAGRAM OF CONNECTIONS OF ROUTIN PRESSURE REGULATOR.

To reduce the spark at the contacts an ingenious method is adopted. The coil 24 has a very low resistance compared with that of the part 12-23 of the potentiometer, and when the lever 16 makes contact with 18 and 22, this part is shunted by the coil, greatly reducing the potential difference between 12 and 23; this also reduces the P.D. exciting the magnet 11—a small current suffices to hold the lever when it has once been pulled down. The remainder of the potentiometer has a much greater resistance than the part shunted, so that the total current through it is not much affected.

But not only is the current through the contacts thus reduced; it is also suddenly interrupted. This is accomplished by the use of *magnetic contacts* 9—10, a complete novelty to us. The spring 10, being of steel, mutual attraction between it and the magnet takes place the moment the latter is displaced from the neutral position, and directly the two are near enough for the magnetic force to overcome the spring, the latter will jump sharply against the magnet. On the contrary, when the magnet is rising the spring will cling to the pole until it is considerably deflected, and will eventually break contact even more suddenly than at make. The device is of ideal simplicity and effectiveness.

The resistance 28 is employed to limit the current absorbed by the motor armature at starting. The beam moves between stops not shown in the figure. For the case when the pressure is rising a precisely similar action takes place on the upper series of contacts, which are distinguished with ticked numbers, and the motor runs in the direction to reduce the excitation. In practice, the beam is mounted on knife edges, and is of light construction, so that a variation of 1 per cent. sets the relays in action in less than $\frac{1}{10}$ second. The currents interrupted at the contacts do not exceed 0·03 ampere at 3 volts, so that the contacts are practically everlasting.

In conjunction with the regulator described above, a differential accelerator can be employed, which gives a working speed proportional to the difference between the driving couple and the resisting torque; it can only be used to modify the speed of working of the governor of the engine or turbine. The essential modification is found in the mode of feeding the armature of the motor at variable instead of constant voltage; this is effected by means of a double sliding rheostat, actuated by differential gear in such a way as to vary the speed of the governor in proportion to the difference between the driving and resisting couples.

Lastly, we may briefly describe the use of a pilot motor with the Routin regulator. It is suggested that the whole of the generators in a station (especially alternators, which necessarily run in synchronism) should be controlled by a single regulator instead of being individually controlled; moreover, extending the principle, separate stations feeding a common network may similarly be controlled from one point, though possibly separated by hundreds of kilometres from one another. It is claimed that the Routin system affords a complete solution to this problem.

Each pilot motor consists essentially of a D.C. motor with constant excitation, actuated by a generator with variable voltage (here called the auxiliary generator). A reversing switch controlled by the central regulator is interposed in the circuit of the motor, and when at rest, the armature of the latter is short-circuited. The field rheostat of the auxiliary generator can be controlled with the aid of differential gear, either by the displacement of the governor of the prime mover or by the central regulator.

At the central position the single-phase rotor of an induction motor is driven by the armature (19) of the central regulator; the stator is wound three-phase. This machine acts as a transmitter, and at each point where control is required, an exactly similar receiving machine is installed, with its single-phase rotor connected in parallel with that of the transmitter, and its three-phase stator connected to that of the transmitter. The rotor of the transmitter is fed with single-phase alternating current.

The shaft of the receiver is coupled through a differential gear with the motor actuating the governing mechanism of the generating sets, and with an ingenious switch in such a way that, whenever the receiver (which exactly copies the movement of the transmitter) is set in motion, the controlling motor is started up in the appropriate direction, and adjusts the governors to the precise position required, at a speed proportional to the magnitude of the variation required.

The receiver consists of a little induction motor of $\frac{3}{10}$ H.P., and can be controlled by three small wires; as the response to the central regulator is instantaneous, very close regulation is possible.

The whole of the apparatus is very simple and compact, and the regulator itself should be of considerable utility, though the proposed system of controlling a number of stations from headquarters is, perhaps, somewhat in advance of British ideas and requirements at present.

PROCEEDINGS OF INSTITUTIONS.

The Public Supply of Electric Power.

By G. L. ADDENBROOKE, M.I.E.E.

(*Abstract of paper read before the* ROYAL SOCIETY OF ARTS (CANTOR LECTURES, II) *on January 18th*, 1909.)

IN the previous lecture the capital costs of power supply undertakings were considered; in Table II the working data are set out. The load factors are conservative estimates for power alone, but allow for a proportion of lighting load. The number of units sold follows from the load factor. The coal consumption per unit sold has been deduced from the best modern practice; at 12,000 B.TH.U. per lb., the overall efficiency of the largest station to the consumer's terminals is 8½ per cent., of the smallest, 6 per cent. If the losses in the motors were included, the efficiencies would be 7¼ and 5¼ per cent. respectively. The sums set down for administration and labour are based upon practice. In most cases these items are about equal. The working costs cover transformation of the current to any suitable pressure.

The great fall in costs as the size of plant increases is borne out by actual results; the larger units of plant cost less for attendance and maintenance, and the cost of distribution is greatly reduced. The allowance of nearly 2½ per cent. for repairs and maintenance is sufficient for plant which is no longer new.

The working costs vary from over ½d. per unit to about half as much in the largest station.

In the last table, 6 per cent. is set down for interest on the whole capital and 3 per cent. depreciation, a generous allowance, but not unduly so, seeing that power supply is and must for a good many years remain a trading adventure. This 9 per cent. amounts to nearly as much as the total working costs, a very usual result. The average selling price that should be obtained is seen to vary from

II.—Station Working Data.

Available output of stations. KW.	Load factor. Per cent.	Units sold to customers per annum.	Lb. of coal used per unit sold, about 12,000 B TH.U.	Coal cost per unit sold, at 6s. 8s. per ton. Pence.
2,500	26	5,700,000	5·25	·188
5,000	28	12,200,000	4·50	·160
10,000	30	27,000,000	4·00	·143
20,000	32	54,000,000	3·50	·126
40,000	34	116,000,000	3·25	·116

III.—Annual Working Expenses.

Available output of station. KW.	Administration and labour.	Coals 6s. 8d. per ton, oil, water and stores.	Rent, rates, taxes, insurance.	Repairs and maintenance.	Total costs.	Cost per unit. Pence.
2,500	£4,200	£4,900	£1,500	£2,500	£13,100	·550
5,000	6,500	8,900	3,000	4,000	22,400	·440
10,000	11,000	16,000	6,000	7,500	40,000	·360
20,000	18,000	30,000	12,000	12,000	72,000	·320
40,000	30,000	60,000	24,000	22,000	136,000	·280

IV.—Revenue and Selling Price.

Available output of station. KW.	Total costs as above.	6 % int., 8 % deprec.; total, 9 % on capital.	Total revenue.	Average selling price per unit, to cover expenditure.	Private supply, same size.
2,500	£13,100	£12,600	£25,700	1·08d.	·68d.
5,000	22,400	20,700	43,100	·85	·51
10,000	40,000	35,100	75,100	·67	·40
20,000	72,000	59,400	131,400	·58	35
40,000	136,000	104,400	240,400	·50	·30

over 1d. to ½d.; in the lecturer's opinion it will be best to erect stations of 20,000 to 25,000 KW. capacity, and these show nearly as great an advantage compared with the small stations. Such stations can be inter-connected and worked in parallel as well as the larger stations, and this is done on a large scale in the Newcastle district and abroad.

Energy supplied from the smallest size station could be sold in bulk for lighting and small motors at 1½d. per unit; larger power users might be charged ·85d. to ·90d. Energy taken during long hours can obviously be profitably supplied at a much cheaper rate. Most of the fixed charges are spread over, say, three times as many units, and twice the quantity of coal will generate three times the number of units, so that, roughly speaking, for nearly continuous loads, the prices shown may be halved. A large long-hour demand close to the station can be supplied at ·2d. per unit, or even less.

Comparing the cost of private with public supply on the basis of the figures given in the tables, and allowing for saving in distribution, administration, labour, &c., the cost (with a plant of 2,500 KW.) comes out at about ·68d. per unit, as against 1·1d. This agrees with actual results. The cost of a private supply, it will be noticed, is about as great as that of a public supply from a station four times as big, and burdened with a distributing system and separate administration. A private plant of 1,000 H.P. can generate at about ·75d. per unit with a load factor of 25 per cent.; thus a 10,000-KW. station can compete very well on a bare cost basis with private plants, especially as they are generally far below this size.

Power supply is now intimately connected with lighting supply, and the two should greatly help one another, as they can be supplied from the same mains with consequent economy. If the price of energy in the case of the 40,000-KW. station were increased 10 per cent., about £8 more per KW., or 80 per cent. more than is allowed in the tables could be spent on the distributing system.

At present, owing to the presence of municipalities in the field, there is a tendency towards the undue development of small undertakings, and to hamper the progress of the really economical systems.

The Modern Electric Power Station.

Transport of coal is generally cheaper than transmission of power; moreover, as power stations use only a cheap small coal, of which one colliery rarely supplies sufficient, it is better for the station to be situated where it can command a supply from competing collieries, rather than at the pit's mouth. Water supply for condensing should provide from 50 to 70 times the weight of steam used; thus, a 10,000-KW. station requires about 1,000,000 gallons of water per hour at full load. Where cooling towers are necessary, the loss by evaporation amounts to about three-quarters the weight of steam used. Too much should not be sacrificed in other ways in order to gain water facilities.

Great progress has been made in the treatment, testing and handling of coal in recent years. Its calorific value is tested, it is graded into sizes, and is handled and weighed by machinery. The water for boiler-feed make-up is also tested and purified, so that deposits inside boilers are things of the past. It might prove economical to distil water for make-up, as on board ship. Boiler-feed pumps are inefficient and wasteful. Water-tube boilers with mechanical stokers are now universally employed, and outputs of 32,000 lb. of steam per hour each are standard practice. Turbines are generally used with steam at 160 to 200 lb. per sq. in., superheated 150° to 300° F.

While the manual labour in the boiler house has been minimised, the responsibility of the stoker has been greatly increased. Under good working conditions a boiler can transfer about 80 per cent. of the heat in the coal to the water and steam inside it; about 10 per cent. is carried away by the flue gases, and nearly as much, say 8 per cent., is lost by radiation, and the last is a constant loss irrespective of the load, so that it becomes at quarter load about 30 per cent. When the boiler is banked, 6 to 7 per cent. of the full-load coal consumption is required merely to keep up steam; the losses at light loads in actual practice are still greater, yet it is better to bank fires than to let down a boiler which is used only for portions of the day. So much depends upon the stoker's intelligence in managing the fires, draught, &c., that with the same plant and loads, differences of 30 per cent. or more in coal consumption may be caused by different stokers. The intelligent use of CO_2 recorders is very helpful.

Now that load factors of 25 per cent. are common, and 30 to 40 per cent. not unusual, the management of the boiler house has become the chief point of interest in a power station. Even in a turbine station of 10,000 KW. the coal consumption is nearly double what it would be if the plant were working continuously at full load; in a 2,000-KW. station with a 25 per cent. load factor, 5 lb. coal per unit sold would be a very good result, whereas with a load factor of 50 per cent. 3½ lb. would suffice.

The efficiency of turbines may be improved another 10 per cent.; but greater prospects of gain are found in the use of producer gas for firing boilers and superheaters, the air supply being under better control and the conditions of combustion more efficient, especially at low loads.

The popularity of the turbine is due not so much to its slightly greater economy as to its cheapness, compactness, simplicity and general suitability for driving electric generators.

For instance, some years ago the L.C.C. installed several large reciprocating engines at a cost of £12 to £13 per kilowatt; recent extensions with turbines have cost £4 per kilowatt. Thus the capital cost has been reduced to one-third, besides the saving in floor space, buildings and foundations which would make the total cost one-fourth that of reciprocating engines. Owing to the high speed of turbines, the energy stored in the rotating parts is about three times what it would be in a reciprocating engine with fly-wheel, and the governing is more sensitive, so that fluctuations of load which would seriously affect the regulation of a reciprocating set have little effect on a turbo-generator. Lastly, the overload capacity of steam turbines, with little reduction of economy, is of enormous importance, 100 per cent. overload for short periods being practicable:—

Steam Turbine Data.

Size in KW.	Average R.P.M.	Size in KW.	Steam per KW.-hour. ½ load.	Steam per KW.-hour. Full load.
500	3,000	1,000	20·50	18·0
1,000		2,000	18·25	16·0
1,500	1,500	3,000	17·00	15·0
2,500		5,000	16·00	14·5
3,000	1,000	7,500	15·25	14·0
5,000				
6,000	750			

The Willans straight-line law applies to steam turbines, so that if the steam consumptions at any two loads are known, the consumption at every load can be calculated. As all the steam used is condensed and returned to the boilers, its quantity can be measured, and records of the coal and water used, electrical output, &c., enable a complete balance-sheet of the working of the station to be kept. It is noteworthy that of late the de Laval impulse turbine principle, as modified by Zoelly, Rateau, Curtis and others, has been largely adopted, and turbines of this type, which are of a more robust construction than the Parsons type, shorter, without a balancing piston, and with larger clearances, are gaining ground.

Although polyphase alternators at 11,000 volts succeed well, it is questionable whether it is not better to operate them at low voltage, and transform up to the requisite pressure.

Modern high-pressure switchgear is exclusively of the oil-break type, generally controlled from a central board; on account of the noise made by the turbines, the control board is frequently situated in a separate building.

The Röntgen Society.

A discussion upon the question of the "Transport of Ions" took place at the last meeting of the Röntgen Society on February 4th. It was opened by Dr. A. Howard Pirie, who said that of the possible modes of conduction of electricity as divided by Sir Oliver Lodge—the bird-seed method, the bullet method, and the fire-bucket method—the first was the category into which ionic medication fell. As a bird carried a seed with it, and only dropped it when it had reached its destination, so an ion carried its electric charge—the smallest known portion of electricity—and dropped it when it reached an electrode. Chemical, toxic, antiseptic and medicinal actions of electrolytic substances were almost exclusively ionic in nature. Speaking of the manner in which different ions entered the skin, Dr. Pirie demonstrated the curious fact that manganese ions entered the skin at points only. It was natural to think, he said, that the current left the skin all over the part touched by the medicament, whereas it was only at certain points that the current left the skin. With regard to the action of the

ions in the deep tissues of the body, Dr. Pirie said that the anions in the depth of the tissues moved towards the positive pole, and the kathions moved towards the negative pole, thus bringing about a change in the chemical composition of the body. The chief disadvantage of using ionic medication, he said, was the fact that it was only possible for the patient to bear a comparatively small current with any degree of comfort. Usually this amounted to about one milliampere per square centimetre. If they had any means of using one phase only of the high-frequency current, they would have a painless method of using 200 milliamperes or more, and probably a great advance would be made. He thought this might be effected by means of a series of valve tubes.

In the course of a discussion, Dr. Lewis Jones read a communication from Prof. Leduc, of Nantes, the pioneer of the ionic method, in which the French investigator pointed out a curious effect he had lately obtained on applying electrodes of copper, iron or zinc to surfaces of gelatine. A film of gelatine impregnated with ferro-cyanide of potassium is taken upon glass, and the metallic electrodes are laid down side by side at convenient distances upon this conducting film. A migration of ions then takes place, forming a precipitate of ferro-cyanide of copper, iron or zinc, as the case may be, and the discolouration due to this ferro-cyanide marks the distance that the copper ions move during the experiment. The strange thing is that the current does not pass evenly from the electrode, but shows a tendency to concentrate around its edges, and several slides were shown in which the patch of gelatine immediately under the electrode remained green as before, surrounded by a ring of brown corresponding to the periphery of the electrode. Mr. W. Duddell thought that the reason why the current preferred to pass out at the edges instead of going equally through the whole surface was because there was a production of oxygen under the electrode, resulting in the partial insulation of the layer of gelatine.

Parallel Operation of Alternators.

By Dr. E. Rosenberg, M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Manchester, January 26th, and London, January 28th*, 1909.)

The working of alternators in parallel has not been so widely discussed in this country as abroad; this is mainly due to the fact that by employing high-speed engines manufacturers have unconsciously kept far from the point where the critical relation between the oscillation of the alternator and the impressed oscillation of the crank mechanism begins.

Hunting troubles are mostly due to resonance which causes a multiplication of small oscillating forces contained in the torque diagram of the driving engine. Theoretically all of the oscillating forces contained can give rise to such resonance. At the present stage of the art, however, with the usual degrees of cyclic irregularity in reciprocating engines, it is mainly an oscillating force with a period at least four times as long as the period of the main oscillations, which causes difficulties in certain machines. So in slow-speed, 2 or 3-crank steam engines where the oscillation of the biggest amplitude lasts a quarter or one-sixth of a revolution, the dangerous amplitude has the duration of 1 revolution. In multiple 4-stroke cycle gas engines with main oscillations of half a revolution, or less, the dangerous oscillation has mostly a period of 2 revolutions. In high-speed engines it is easy and for mechanical reasons, general practice, to apply a greater fly-wheel effect than the critical one. In slow-speed machines where such a fly-wheel effect would be prohibitive, it is important to reduce the oscillations in question to the smallest possible value, and to apply an amortisseur. If the fly-wheel effect is well over the critical point, an amortisseur is unnecessary, although it is beneficial in the case of engines of irregular disturbances in the diagram. The point of resonance is characterised by the reaction quotient—*i.e.*, the ratio, for a certain displacement, of the additional torque to the initial oscillating torque that causes this displacement. For full resonance this quotient is unity.

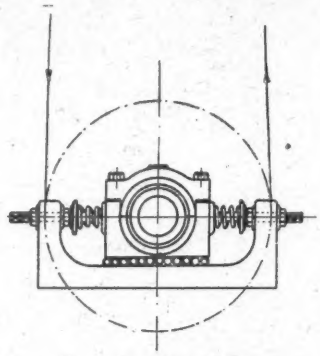
If the fly-wheel cannot be altered, the critical value can be avoided by adequate choice of the short-circuit current of the electrical machine, provided that this is consistent with the specified electrical regulation. The air-gap may be either increased or reduced for this purpose, or choke coils may be used instead of an air-gap reduction.

The theory is fully worked out in the paper, and curves are given showing the critical values of the fly-wheel effect for various types of steam and gas engines at speeds from 60 to 200 R.P.M. The author gives examples of troubles due to hunting, and investigates the causes, and describes the means employed to remedy them.

Example A.—A 1,200-H.P. vertical three-crank engine coupled to a 1,050-K.V.A. alternator, running at 125 R.P.M., 50 cycles, gave trouble when running in parallel with other sets, and calculation showed clearly that for oscillations of the duration of 1 revolution, the reaction quotient was very near to unity. In fact, for different loads it varied from 0·9 to 1·1, giving for a certain excitation exact resonance. The fly-wheel effect was 160 ton-metres^2. The machine was a three-phase generator wound for 2,850 volts, 213 amperes normal load, and the short-circuit current was estimated as from 600 amperes for no-load excitation to 810 amperes for full-load excitation. Each pole had a proper damper cage. As hunting troubles occurred in spite of this, it was pretty clear that the initial oscillations in the torque diagram were greater than would be expected in steam engines of this type. When the engine-maker, on request, forwarded the drawings of the engine, the trouble was very soon explained. There was a single-acting condenser pump attached to the engine, the maximum load torque of which corresponded to something between 10 and 20 per cent. of the normal load torque. When, soon after, a trial without condenser pump was made, hunting disappeared. Whereas, with the pump attached, great oscillations were reported and the lights flickered badly, there were only small oscillations without the pump, and the lights were steady.

The final solution for this machine was a bigger fly-wheel.

Example B.—Compound engines of 3,000 H.P. and 90 R.P.M. with a fly-wheel effect = 1,300 ton-metres^2, driving three-phase machines of 48 periods, showed objectionable hunting with oscillations of the period of 1 revolution. Using either the formula for the reaction quotient or one of the curves, it is quite clear that the fly-wheel



Balancing Apparatus.

effect of this machine is almost identical with the critical value. The machine had no separate amortisseurs, but solid steel pole-tips. The hunting was considerably diminished by applying a balance weight in the fly-wheel, so as to minimise the primary oscillations of the duration of 1 revolution.

In later machines of the same type the fly-wheel effect was increased.

Example C.—Cross-compound engines running at 83 R.P.M. with a fly-wheel effect of 1,400 ton-metres^2, driving three-phase generators of 2,100-K.V.A. output, 50 periods, were hunting with the periodicity of the revolution. No separate dampers were used, and the normal output was 5,250 volts, 232 amperes. The short-circuit current of the machine for different excitations varied between 530 and 760 amperes. The machine is in the danger zone. By very carefully equalising the steam distribution, it was possible for the time of the experiment to maintain parallel operation without great oscillations.

Example D.—Another interesting case is a station with reciprocating engines running at 94 R.P.M., which were running in parallel for years. Later on, the central station was extended by the addition of a turbo-generator, and serious hunting troubles occurred. The turbo set, running at 1,500 R.P.M., had a total fly-wheel effect (turbine and generator) of 1,675 kilogramme-metres^2. The generator was a four-pole, single-phase machine of 1,500 KW. (1,875 K.V.A.). Taking the period of a revolution of the reciprocating engines, that is, 0·638 second, as the period of an impulse cycle, we find that complete resonance would occur for a short-circuit current equal to 1·7 times normal current. When a new turbo-generator was designed for the same station, it was not possible to increase the fly-wheel effect to such an extent as to make the reaction quotient for any excitation sufficiently small, but care was taken that the short-circuit current should be pretty well above this value, and the reaction quotient greater than 1 for the period of 0·638 second, such that the critical period is between the two danger zones for 0·638 and 0·319 second. Also the machine was fitted with a good damper.

In an appendix the author describes a balancing apparatus used for high-speed machinery, consisting of two bearings sliding on horizontal rails by means of balls, and subjected to the action of springs, which tend to keep the bearings in the neutral position.

The rotor under test is driven by means of a vertical belt, so that no horizontal component of the belt tension exists. If there is a heavy point the rotor will oscillate on the horizontal rails.

The displacement is quite independent of the speed (if no friction and no spring tension are apparent), and will be only a very small one if we have an ordinary degree of exactitude of workmanship.

As soon as we have springs the displacement is enlarged, and at a certain critical speed attains a maximum.

Balancing with this apparatus is therefore very simple. The rotor is brought up to such a speed that heavy resonance occurs; the most prominent part is marked by chalk, and it is noted that the heavy point is leading by 90° in the direction of rotation.

If we have two heavy points at different relative positions in two cross-sections, they will, when the rotor is rotating, cause a movement of the axle such that one bearing goes to the right, and the other to the left. As in the previous case, the movement of the bearings will cause an additional turning moment of the springs. The proportion of the additional spring moment to the primary moment caused by dynamic unbalance will depend upon the distance of the bearings, and in general, at a certain speed it will not have the same ratio as the force considered

above. This means, resonance of the bearing spring arrangement caused by dynamic unbalance will take place at another speed to resonance for static unbalance. The two speeds with dynamo rotors of ordinary shape have a ratio of about 1 : 1·5, or 1 : 1·7. For instance, with a certain rotor and certain springs, remarkable movements of both bearings in the same direction were attained at 510 R.P.M., movements in opposite directions at 860 R.P.M. With the same springs and a bigger armature, the two critical speeds were 300 and 490 R.P.M. These values checked remarkably well with the values calculated from the size of the springs and the mass and inertia of the rotor.

With the same arrangement the rotor can be balanced statically and dynamically in two steps, and we can work with a comparatively low speed and have much bigger movements than if we work in the proper turbine bearings without the spring arrangement.

Discussion.

Mr. Miles Walker (in the course of a written communication) said the curves given would enable them to tell almost without calculation whether any particular alternator set would run in parallel in any particular station.

Mr. S. J. Watson (in the chair) said that since 50 had become the standard frequency it simplified considerably the problem of parallel running. It was where different types of prime movers were installed that it was difficult to run in parallel. The best type of prime mover for parallel running was undoubtedly the steam turbine, and the second best the high-speed multiple crank compound engine.

Mr J. S. Peck knew of a few cases where both engines and generators were made by the same firm and at the same time to the same specification, and yet there was the greatest difficulty experienced in their parallel operation.

Mr. R. Porter had seen a number of double-acting tandem engines driving alternators in parallel with absolutely no trouble, but had only noticed in one instance the use of special damper devices. In this instance twin tandem double acting 2,000-H.P. sets were installed. The single-phase generators had solid steel poles, with a brass ring on either side of the rotor fixed to the pole pieces with brass screws. Usually the only specification the gas engine makers received was that the fly-wheel effect should be sufficient to ensure a cyclic irregularity not exceeding 1 in 250. This was calculated graphically from the engine curves, and a good margin of safety added to allow for possible misfires, &c. He was not aware that generator makers ever gave any information as regarded the electrical conditions of their machines, as the author stated should be done.

Mr. A. E. McKenzie related an instance of hunting which came under his notice about eight years ago in London. The original installation at the station consisted of a number of alternators of 200 K.V.A. running at 200 R.P.M., 50 periods; then three 400-K.V.A. sets were installed driven by single-crank engines. Either of these sets would run equally well with the original sets, but they would not run together. He tried synchronising the cranks at all angles, also a megaphone and contact pieces on the fly-wheels, but could not get them to run in parallel. The trouble was eventually cured by putting copper damping rings round the pole pieces. In the same station were some motor-alternators which were identical, but would not run together in parallel, though they would run with any of the other sets. That trouble was overcome by shaping the edges off the poles, thus making the air-gap between the pole pieces greater.

Mr. C. C. Aitchison said the only occasion he remembered when they ran alternators in parallel was due to carelessness, and afterwards they had no switchboard, as it was blown up. Some time ago he had occasion to run some motor alternators. The machines hunted badly and finally had to be shut down. Then an amortisseur coil arrangement was fitted and the machines had run satisfactorily ever since.

Mr. A. F. Guy asked whether if the cut-off in one of two steam-driven alternators, was a shade earlier than the other, that would induce surgings and harmonics.

Mr. M. Hartenheim said that in a case which had come to his knowledge, old generators, the wave form of which differed widely from the ordinary sine curve, refused to run in parallel with modern generators with sinusoidal E.M.F. curves. The trouble was overcome by simply altering the pole tips of the old machines. It was clear that great differences in the instantaneous values of the E.M.F. curve produced heavy cross currents between the machines, and they might unfavourably affect the parallel running of the machines.

Mr. J. H. Thomas mentioned a case where an alternator of 1,600 KW. output was driven by a twin tandem gas engine of 2,400 H.P. The fly-wheel weighed about 76 tons. The firm he was connected with had developed a special type of alternator where the rotor revolved outside the stator. It made an ugly construction but seemed efficient. He thought all manufacturers of A.C. machinery, if they did not fit damper arrangements, should make provision for their addition in case of future trouble. He did not see why gas and steam-driven alternators should not be run in parallel.

Mr. A. G. Cooper and Mr. A. R. Dunton also took part.

Dr. Rosenberg, in reply, said that damping arrangements in generators driven by single-acting gas engines with one explosion per revolution were not necessary, and gave no advantage in 50-cycle machines of the standard regulation and speed of 100 R.P.M. or more. The case of hunting, mentioned by Mr. McKenzie, was hardly to be ascribed to crank mechanism, as in engines of this speed, the fly-wheel effect, as a rule, was sufficiently above the critical value, but it might be the engine governors that were responsible for hunting. Mr. Hartenheim mentioned the influence of the wave form of the E.M.F., but this wave-form difference gave rise only to wattless current of higher frequency and not to a fluctuation of power. If in certain cases a change in the pole tips of an alternator affected the hunting, then it was not due to the change in wave form, but to the change of the short-circuit current connected with changing the pole arc. This was equivalent to an alteration of the air-gap.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"E. A." writes:—"We shall be obliged if you will kindly let us have your opinion as to whether a company formed for electric lighting purposes in a small town would be taking any undue risk if they laid cables underground in the streets without a provisional order, but with the written sanction and support of the corporation. There is a gas company in the town."

*** It is difficult to see any objection to the scheme proposed in the above query. No provisional order is necessary; and if the corporation do not object to the cables being laid under the streets, the position of "E. A." will be almost as good as if he had a provisional order. The gas company cannot interfere.

"G. R. M." writes:—"A few months ago a traveller introduced some metallic-filament lamps and left leaflets stating consumption and candle power. On the strength of these leaflets I sold a considerable quantity of these lamps. One customer in particular had these lamps, and I gave him in writing his approximate consumption with carbon-filament lamps and his approximate consumption with these particular metallic-filament lamps, basing my calculation upon the figures given in the leaflets. I have just received a letter from this customer saying I grossly misled him, for instead of his bill for the Christmas quarter being about one-third less as I stated, it has increased 45 per cent. (hours of burning being practically the same). He says he has called in an independent authority, who has tested the lamps and gives this result—two 16-C.P. lamps 25 watts (as I stated) only give 10 and 12 C.P., and each consumes 29 watts; two 16 C.P. lamps 25 watts (as I stated) give 16 C.P. and consume 45 watts. He says upon this test he is going to claim for the difference from what I stated to what he has got to pay, and also says I must remove the lamps and replace them with lamps giving same result as I stated, or refund his money. If I won't do this he will take the matter to court and expose the fraud. Can he legally do this, and can I sue the firm who so grossly misled me?"

*** This query raises some nice questions as to the law of warranty on the sale of goods. All the original vendor did was to sell certain lamps together with certain leaflets explaining their efficiency. Do the leaflets amount to a warranty? The Sale of Goods Act, 1893, provides by Sec. 14 that where a buyer expressly, or by implication, makes known to the seller the particular purpose for which the goods are required so as to show that the buyer relies on the seller's skill or judgment, and the goods are of a description which it is in the course of the seller's business to supply, whether he be the manufacturer or not, there is an implied condition that the goods shall be reasonably fit for such purpose; provided that in the case of a contract for the sale of a specified article under its patent or other trade name there is no implied condition as to its fitness for any particular purpose. The section then goes on to provide that where goods are bought by a description from a seller who deals in goods of that description (whether he be the manufacturer or not) there is an implied condition that the goods shall be of merchantable quality; provided that if the buyer has examined the goods there shall be no implied condition as regards defects which such examination ought to have revealed. It is difficult to say how the law applies to the state of things under consideration. Suppose a man sells a metallic-filament lamp as such, he is not liable if it fails to do what the customer thinks it ought to do. Upon the whole, however, if a vendor chooses to puff an article by pamphlets it is probable that he may be held liable if they do not fulfil the condition. If "G. R. M." is sued by his own customers he can probably sue the original vendor, and recover as damages the damage which he has had to pay and the costs incurred in defending himself. He should, however, see a solicitor, and let him have copies of the pamphlets, for much will turn upon the exact wording of those documents.

Siamese Naiveté.—A correspondent sends us the following cutting from the *Evening Dispatch*:—In Siam, when your electric light goes out, the remedy is simple, as seen in the following notice:—"Bangkok. Sir, for the case that your electric light should fail, we beg to send you enclosed a postcard which should please send us at once when you find your light out. The company will then send you another post-card. Yours truly, Manager, Siam Electricity Co., Ltd."

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

"Metallic" Devices.

As announced in our "Business Notices" columns a few weeks ago, a new catalogue of electric light and power accessories for use with the "Metallic" system of steel conduits and fittings has been issued by the Metallic Seamless Tube Co., Ltd., of Wiggin Street, Birmingham. In the accompanying illustrations we show a few of the more interesting devices that are included in this list.

Fig. 1 shows, three-quarter size, their "Metallic" ball fitting (cord grip and shade grip) with stem, which is supplied finished in either polished brass or steel bronze. Fig. 2 represents full-size a double-pole white porcelain connector for use in conduit boxes, the current-carrying parts being completely embedded in porcelain, while a specimen of their porcelain cleat and knob insulators

Fig. 1.

Fig. 2.

Fig. 3.

appears in fig. 3. Fig. 5 depicts a high-voltage two-pin wall plug and socket of improved pattern for heavy currents; it has no exposed metal at the base, and the plug contacts consist of one solid piece of brass; the base is of block china, and the plug of polished ebonite. In fig. 4 there appears one of the company's specialities

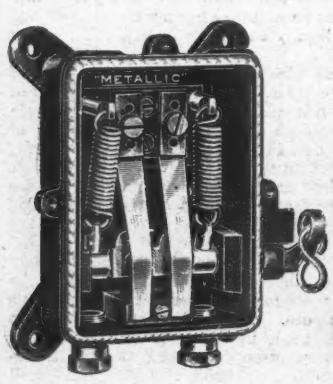


Fig. 4.

Fig. 5.

for electric bell and signal work in mines—a water-tight mining bell pull. The firm specialises in ironclad gear for all purposes, their "Reliance" switches being specially designed for colliery work. Space will not permit us to allude to more of the manufactures of the firm here, but no doubt installation contractors and engineers will secure the catalogue for themselves.

Automatic Thermal Cut-Out for Electric Flat-Irons.

The Pacific Electric Heating Co., Ontario, Cal. has devised an improved automatic cut-out electric flat-iron. The automatic feature is entirely mechanical. In the space between the heating units at the back part of the iron, there is located a small perforation containing a metal which softens with excessive heat, and also a spiral-shaped metal spindle. When the iron overheats, the metal in the well softens, allowing the spindle to revolve, thereby releasing a spring attached to the upper portion of the iron just under the handle, which disconnects the current from the iron by throwing the switch plug entirely out of the socket. The spring is thoroughly insulated with asbestos from the lower portion of the iron, so that it cannot, it is claimed, get hot enough ever to cause it to lose its tension. To replace the switch plug it is necessary to use considerable pressure. The spring re-engages with the spindle as soon as the metal in the well has hardened sufficiently to keep the spindle from turning, and the plug is then allowed to take its normal position in the socket, thereby again putting the iron in circuit.

These irons have been in practical service in many laundries for several months, and it is stated that without exception the users have furnished reports which indicate that the mechanism is sure to work in every instance, and is in no way affected by constant heating. The company claims that there is no deterioration shown in the irons that have been equipped with this automatic cut-out mechanism, and that this device will absolutely protect the iron against the usual burn-outs.—*Electrical World.*

Cable Ends.

As announced in our pages a fortnight ago, Messrs. Davis and Timmins, Ltd., have brought out a new list of cable ends. Their object has been to devise a uniform set of patterns giving a maximum efficiency with a minimum of cost. The range is very extensive, the set having a carrying capacity from 10 to 600 amperes.

Inasmuch as in the past Messrs. Davis & Timmins, Ltd., have been the pioneers in standardising screw threads, &c., they have felt the

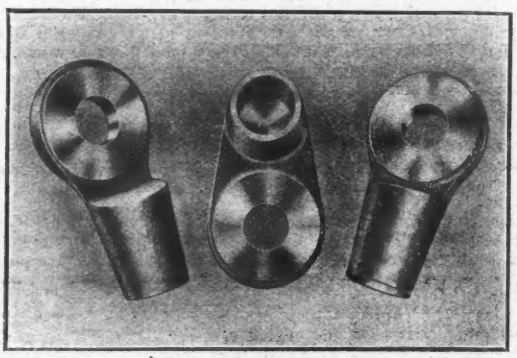


Fig. 6.—Standard Cable Ends.

necessity for standardising cable ends for the convenience of electrical engineers and others. These cable ends (fig. 6) are of uniform design; the three patterns of each size follow the same dimensions, which is a considerable advantage in switchboard work, where appearance is a consideration. The middle one, it will be noticed, is particularly suitable for cables leaving a board at right angles. In every case the bolt holes have a boss on both sides which, being faced, ensures an absolutely perfect surface contact.

The bolt holes are drilled to take a standard Whitworth bolt, and the bosses are large enough to take standard washers and nuts. The cable holes are drilled to take standard cables.

For the convenience of electrical engineers these cable ends are kept in stock.

Self-Welding Wire Joint.

The Harvard Electric Co., Chicago, Ill., has placed on the market a copper self-welding wire connecting joint which consists of two longitudinal metal barrels, the inner sides of which have bevelled edges, as shown in the accompanying illustration (fig. 8). These

Fig. 7.—Self-Welding Wire Joint.

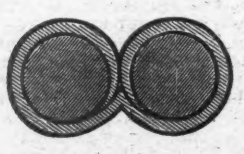


Fig. 8.—Cross-Section of Joint.

bevelled edges serve as a guide for the rest of the sleeve by creeping round the inside of the barrels when they are twisted, allowing the two sides of the sleeves to overlap themselves as much as is necessary to conform to the inequalities of the wires which are being joined. When the joint is properly applied, the connection is said to be almost perfect and to possess great strength. The makers claim that moisture cannot penetrate into it after it has once been twisted. The joint can be used satisfactorily in connecting wires which do not differ more than two gauges in size.—*Electrical World.*

Anti-Vibrator for Wire Lamps.

The accompanying illustration (fig. 9) shows a neat and simple device introduced by The "Attracta" Electrical Co., of 75, Fetter Lane, E.C. (note new address), for suspending metallic-filament lamps and protecting them from vibration. The springs are of tempered steel, nickel plated, and the hooks are insulated. They are made in two sizes.

Ignition on Motor Cars.

Magneto ignition is gradually supplementing all other methods of igniting the charge in the petrol engines of motor cars, the tendency being particularly marked in the direction of magnetos of the high-pressure type. Two principal forms of high-pressure magnetos are being employed—one in which the current produced at low pressure in the armature is transformed by an external induction coil; in the other the armature of the magneto is provided with two windings, low and high pressure—that is to say, the transforming of the current is effected in the magneto itself, as shown in the diagram (fig. 10), for which we are indebted to *Le*

Fig. 9.—Anti-Vibrator.

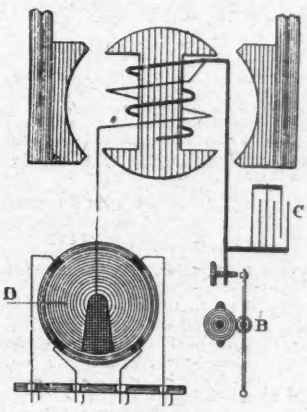


Fig. 10.—High Pressure Magneto.

Génie Civil. In this B is the contact breaker which breaks the primary current; C is a condenser, and D a distributor sending current to the different cylinders of the engine. In view of the reduced space occupied and the greater simplicity of the connections, it is this type of machine to which preference is being given by motor-car manufacturers.

The Western Electric Co. has recently brought out a new system of ignition by trembler coils, in which the coils (specially made to resist heat) are mounted directly on the engine cylinders with the object of reducing the length of the high-pressure circuit, which is difficult to insulate. A single trembler is employed for all the coils, and a reversing switch enables the direction of flow of the current to be reversed in order to preserve the contact points of the trembler. In reality, although there is only one trembler in operation at a time, there are really two, of which one or the other may be employed at will. One gives a fat spark well suited for starting purposes, the other, for smaller consumption of current, gives a weaker spark suitable for operating the engine when it has been started and is running normally.

Naval Dockyards.—A proposal put forward by the Admiralty in connection with the working hours of the men employed in the dockyards has not been favourably received. The main idea was to prolong the dinner hour by a quarter of an hour and make up for it by working later in the evening. It has been maintained in some quarters that the expense of electric light during the extra time in the evening would make a considerable difference in the matter of dockyard expenditure during the winter. This, of course, is nonsense; all the yards are now fitted with their own electric light installation, which can be used for the purpose of lighting ships under repair. Formerly, when ships had to use their own dynamos and keep a boiler specially lighted for the purpose, the expenditure in coal and labour was considerable, but under present conditions the expense of lighting cannot in any way be balanced against the work obtained during dark hours.

Medical Electricity.—In July next a convention dealing with all branches of this subject will be held at University College, London, together with an exhibition of apparatus. The organising secretary is Mr. E. Schofield, 11, Chandos Street, Cavendish Square, W.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

BULGARIA.

(*Continued from page* 240.)

	Frcs. per 100 kg.
Copper and brass wire for telephones, electric connections and similar purposes:	
Wound with silk	60
Wound with other textile materials	45
Others	25
Note.—Laces, cords and other similar articles of wire of common metals, for telephones or electric connections, are dutiable under this heading.	
Cables of all sorts	30
Articles of copper, brass or bronze, cast or turned; articles of sheet copper or other sheet metal, painted or not, polished or not, combined or not with other common materials, but not engraved, varnished, nickelled, silvered or gilt	100
Note.—This heading includes lustres, lamps, fittings for stoves, chandeliers, flat-irons, carriage fittings, frames, weights, tools for different trades, and generally all articles of this sort in brass, copper or bronze.	
Bells, including bells weighing more than 15 kg. (33 lb.) each	80
Articles of copper, brass or bronze, engraved, varnished, nickelled, silvered or gilt, combined or not with other materials, except ivory, tortoise-shell, mother of pearl, real agate, amber, silk, precious metals, fine or semi-fine stones	200
Note.—If these articles are combined with ivory, tortoise-shell, or other fine materials, they pay according to description; while if combined with precious metals, they are classed according to their kind, under goldsmiths' wares and jewellery.	
The above heading includes candelabras, lustres, carriage or other lamps, small fancy articles, such as statuettes, &c. It also includes articles mentioned under previous headings in brass, copper or bronze, if engraved, varnished, lacquered, or slightly nickelled, silvered or gilt. Articles of aluminium bronze are also included. When any of these articles are combined with common material, chargeable by themselves at a lower rate of duty, such as marble slabs, &c., the importers may, if it is possible to separate them, require them to be separately taxed.	
Iron and steel in bars, plates or sheets	2·50
Rails and sleepers of iron or steel	2
Frogs and tongue rails for railway crossings	2
Steel or iron wire, with a diameter of 6 mm. or less,	
(*a*) Ordinary wire, black or polished, even galvanised	7
(*b*) Ditto, tinned or coated with copper or lead, including telegraph wires	12
Pipes and conduits of iron and their joints, even tarred	8
Instruments and apparatus of precision, for calculation, physics, chemistry, and astronomy:—	
Electric arc lamps, with or without glass globes; gas and water meters	60
Electrical apparatus for weak currents (telegraphic, telephonic and signal apparatus and accessories and detached parts of such apparatus); electrical apparatus not mentioned for lighting, power transmission and electrolysis; accessories and detached parts of such apparatus, *e.g.*, connecting switches, lampholders, safety fuses	80
Electric meters and registers	100
All other instruments of precision, and for calculation, physics, chemistry and astronomy, including photographic apparatus	150
Note.—This heading includes electric and magnetic apparatus, and telegraphic instruments, pneumatic and mechanical instruments (dynamometers and others).	
Machines and parts and accessories thereof, and apparatus, of cast or wrought-iron, or of steel, not specially mentioned	free.
Motors of all sorts, except water turbines, even combined with machines; boilers for steam engines; electric machines; machine tools, &c.	free.
Note.—Machines, apparatus, detached pieces and indispensable accessories of machines of other materials than iron or steel are dutiable according to the material; but parts of copper or brass fixed to a machine made of iron or steel do not affect the classification.	
This heading also includes detached pieces and indispensable accessories of machines, imported simultaneously with the machines of which they form part.	

Pumps, per 100 kg.	10 fcs.
Locomotives, tenders, vans and wagons of all sorts for passengers and merchandise	15% ad val.

Note.—Wagons imported by the State Railway Administration are free of duty.

Tramcars of all sorts	15% ad val.
Batteries for electric bells, per 100 kg.	10 fcs.

Note.—Electric batteries of all kinds and for all purposes will be dutiable under this heading.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

1,741. "Improvements in switches for electric lampholders and other purposes." J. H. Hewitt. January 25th.

1,758. "Improvements in and relating to electric arc lamps." A. Herwig (trading as the firm August Schwartz, Bogenlampenfabrik). January 25th.

1,760. "Improvements in or relating to electric traction." T. G. Gribble. January 25th.

1,761. "Improved electric signal transmitter." G. H. Oatway. January 25th.

1,788. "Improvements in or relating to electric signalling systems." J. D. Taylor. (Date applied for under Sec. 91 of the Act, January 30th, 1908, being date of application in United States.) January 25th. (Complete.)

1,800. "Improvements in disconnecting boxes and the like for electric cables." W. T. Henley's Telegraph Works Co., Ltd., and W. H. Nichols. January 25th.

1,813. "Improvements in arc lamps." P. Hanisch and Regina Bogenlampenfabrik G.m.b.H. January 25th. (Complete.)

1,820. "Improvements in and relating to the supply and regulation of electrical energy for train lighting and the like." P. L. R. Fraser and T. Accumulator Co., Ltd. January 25th.

1,878. "Improvements in and relating to apparatus for electrical signalling at high speeds." J. W. Bowman. January 26th.

1,879. "Improvements in or connected with electrolytic cells." L. H. Walter. January 26th.

1,896. "Rent-collecting means for telephone service." R. Yearneau. January 26th. (Complete.)

1,904. "Improvements in telegraph poles and the like." W. S. Rawson. January 26th.

1,922. "Improvements in air-heaters for electrically-heated air baths." W. Otto. January 26th. (Complete.)

1,927. "Improvements in and relating to mechanism for electrically-recording recurring movement or impulses, particularly applicable to measurement of air and water velocity." R. M. Lowne and Lowne Electric Clock and Appliances Co., Ltd. January 26th.

1,928. "Improvements in electric lamp filaments." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 26th.

1,934. "Electrical emergency stop motion." G. Ford. January 27th.

1,948. "Improvements in and relating to electro-mechanical apparatus for the transmission, reception, and indication of preconcerted signals." A. E. Vickery. January 27th.

1,959. "Improvements in arrangements for charging and discharging accumulators." A. M. Taylor. January 27th.

1,978. "Improvements in or relating to electrical ignition for internal combustion engines." J. D. Bell. (Application for Patent of Addition to No. 195/09.) January 27th.

1,998. "Improvements in electric resistances." M. Brull. (Date applied for under Sec. 91 of the Act, February 1st, 1908, being date of application in France.) January 27th. (Complete.)

2,016. "Improvements in alternating current magnets for resonance apparatus." G. G. M. Hardingham. (Hartmann & Braun Akt.-Ges., Germany.) January 27th. (Complete.)

2,027. "Improvements in electric arc electrodes and in processes of making them." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 27th.

2,028. "Improvements in the process and apparatus for the manufacture of electric lamp filaments." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 27th.

2,029. "Improvements in electric lamp filaments and methods of manufacturing same." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 27th.

2,071. "Process for purifying carbon for electrical and other purposes." W. Clacher. January 28th.

2,076. "Improvements in apparatus for use in connection with electric cables." C. J. Beaver and E. A. Claremont. (Date applied for under Rule 13, March 23rd, 1908. An invention comprised in application No. 6,477, dated March 23rd, 1908.) January 28th.

2,106. "Improvements in and relating to holders for electric lamps." W. Green. January 28th. (Complete.)

2,127. "Improvements in and relating to electrical insulating material." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) (Application for Patent of Addition to No. 19,035/1905.) January 28th. (Complete.)

2,128. "Improvements in and relating to electrical insulating material." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) January 28th.

2,130. "Improvements in and relating to electric accumulators." T. H. Wright. January 28th.

2,144. "Automatic controlling switch for electric transformers." E. F. Terrey, H. S. Peatey and J. Hunt. January 29th.

2,147. "Improvements in electric accumulator sub-stations fed from alternating-current systems." A. M. Taylor. January 29th.

2,150. "Improvements in electrical block apparatus." E. W. Smith. January 29th.

2,151. "Improvements in telephones." E. W. Smith. (Application for Patent of Addition to No. 22,638 of 1907.) January 29th.

2,169. "Improvements in and relating to telegraphy and telephony by earth conduction." A. W. Sharman. January 29th.

2,176. "Improvements in and relating to dynamo-electric machines for the speed regulation of the screws of ships, ventilating fans and the like." Siemens Bros. Dynamo Works, Ltd., (Siemens-Schuckertwerke G.m.b.H., Germany.) January 29th. (Complete.)

2,177. "Improvements in and relating to dynamo-electric machines for searchlights and the like." Siemens Bros. Dynamo Works, Ltd., M. Kloss and J. C. Wilson. January 29th.

2,212. "Improvements in or connected with holders for electric lamps and shades or the like." T. Bailey. January 29th.

2,213. "Improvements in the construction of tangent galvanometers." J. M. Maiben. January 29th.

2,216. "Process for producing long voltaic arcs." Centralstelle fur Wissenschaftlich Technische-Untersuchungen G.m.b.H. (Date applied for under Sec. 91 of the Act, February 1st, 1908, being date of application in Germany.) January 29th. (Complete.)

2,217. "Improvements in electro-magnetically controlled electric switches." A. H. Curtis, A. H. Mackley and Adams Manufacturing Co., Ltd. January 29th.

2,222. "Improvements in and relating to electric light apparatus on vehicles." E. Watts and Optima Tyres, Ltd. January 29th.

2,223. "Improvements in and relating to constant speed devices for dynamos on motor-driven vehicles." E. Watts and Optima Tyres, Ltd. January 29th.

2,252. "Improvements in or relating to electrical-contact devices." A. E. Lamkin and J. F. Wetjen. January 30th.

2,268. "Continuous current, commutatorless dynamo-electric machine." F. de Lantour. January 30th.

2,286. "Improvements relating to the generation and transmission of electromotive power." G. W. Mascord. January 30th.

2,287. "Improvements in fuse-switches." A. L. Weekes. January 30th.

2,311. "Improvements in or relating to contact-making devices for use with trolley wires." R. A. Dawbarn. January 30th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Transforming Machine for Operating Arc Lamps and Incandescent Lamp Circuits of Low Voltage. W. Schäffer. 26,762. December 3rd. (Date applied for under International Convention, December 3rd, 1906.)

Process for the Electrolytical Refining of Copper. J. Awalow. 26,329. December 4th.

1908.

Electrical Distribution. A. J. Boult. (J. L. Woodbridge, United States.) 346. January 6th.

Electric Burglar-Alarm Apparatus. W. Blut. 505. January 8th.

Reproduction of Pictures, Drawings and the like, at a Distance. Amalgamated Radio-Telegraph Co. and N. Maskelyne. 658. January 10th.

Suspension Devices for Electric Conductors. F. Guillot. 1,240. January 18th. (Date applied for under International Convention, October 10th, 1907.)

Ignition Apparatus for Internal-Combustion Engines. R. F. Collum. 1,288. January 20th. (Post-dated August 19th, 1908.)

Electric Power Transmission Systems Employing Fly-wheel Machines. W. L. Spence. 1,559. January 23rd.

Electric Coin-Freed or Prepayment Meters. F. J. Beaumont. 1,959. January 28th.

Magnetic Separating Machines. Rapid Magnetting Machine Co., H. H. Thompson and A. E. Davies. 2,203. January 31st.

Electrical Transmission of Power. C. Cleiren. 2,245. January 31st. (Date applied for under International Convention, October 10th, 1907.)

Series-Parallel Electric Lighting Circuits. W. H. Exley and H. Leitner. 4,066. February 22nd.

Electrical Terminal Connections. S. Ridgway, F. J. Ridgway and C. M. Brunt. 4,683. March 2nd.

Electric Motor Controllers. British Thomson-Houston Co. (General Electric Co., United States.) 5,611. March 12th.

Mono-Telephone Relay Applicable to Printing Telegraphy. Soc. des Telegraph Multiplex. (Systeme E. Mercadier.) 6,767. March 26th. (Date applied for under International Convention, March 27th, 1907.)

Means for Attaching Shades and Reflectors to Incandescent Electric Lamps. C. W. Dawson. 7,674. April 7th.

Electric Motor Controllers. British Thomson-Houston Co., H. C. Hastings and W. L. Wise. 7,844. April 8th.

Incandescent Electric Lamps. British Thomson-Houston Co. (Allgemeine Elektricitäts Ges., Germany.) 10,341. May 12th.

Electric Fire, Robbery and Burglary Alarm. H. Leenders. 10,591. May 15th.

Telegraphic Relays. E. G. B. Maxse. (J. T. Piat, Reunion.) 10,699. May 16th.

Electro-Mechanical Regulators or Governors for Electric Generators, Electric Furnaces and the like. Soc. Francaise des Procédés J. L. Routin pour le Compoundage Electro-Mecanique des Groups Electrogènes. 11,038. May 21st.

Electric Furnaces. H. Helberger. 13,257. June 22nd.

Conductors for Alternating Electric Current. A. Wolff. 13,678. June 27th.

Electrical Propulsion of Ships. Siemens Bros. Dynamo Works and M. Kloss. 16,491. August 5th.

Electric Furnaces. A. H. Imbert. 17,281. August 17th.

Electric Cables. Land und Seekabelwerke Akt.-Ges. 17,580. August 19th. (Date applied for under International Convention, September 7th, 1907.)

Manufacture of Refractory Conductors. W. C. Arsem. 17,618. August 21st. (Date applied for under International Convention, August 21th, 1907.)

Containing Case or Receptacle for the Sparking Plugs of Internal-Combustion Engines. R. J. Hall. 20,771. October 2nd.

Resistance for Electrical Heating and Cooking Apparatus and other Purposes. Cooper. (Boelling.) 21,498. October 10th.

Device for Fixing Carbon Brush-Holders. Firm of R. Bosch. 21,568. October 12th. (Date applied for under International Convention, September 28th, 1908.)

Electrical Resistances. G. Cooper. (F. Boelling, Germany.) 21,756. October 14th.

Electric Motor for High-Tension Currents. W. Myschkin. 22,740. October 26th.

Electric Furnaces. British Thomson-Houston Co. (General Electric Co., United States.) 23,071. October 4th.

Alternating-Current Commutator-Electric Machines. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges.) 23,933. November 9th.

Magneto-Electric Ignition Apparatus. Firm of R. Bosch. 25,855. November 30th. (Date applied for under International Convention, October 31st, 1908.)